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Request for Comments

A REGTECH MANIFESTO

Redesigning Financial Regulation for the Digital Age

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INTRODUCTION AND INVITATION TO COMMENT

Even before the upheaval wrought by the Coronavirus pandemic, technology was transforming every facet of our lives. Medical care is leveraging gene therapies. Music, movies and TV stream on demand on our personal screens, large and small. Retailing has moved online and is delivering packages by drone. 3D printers can make houses, cars and body parts. Driverless vehicles navigate public streets. "Driverless finance" is coming too, as smart devices begin to help us manage money, pay bills, avoid scams, spend wisely and plan for the future, regardless of our wealth or financial education.

Changes like these all have the same technology at their core: the information in these systems is being converted into digital form. This is causing the volume of accessible data to explode and is enabling users to organize and analyze it with artificial intelligence techniques that, in every field, are converting formerly impossible tasks into easy ones.

In the midst of this accelerating digitization, the COVID-19 pandemic struck the world. In a few short weeks, the crisis laid bare the inadequacies of systems in sector after sector that rely on old, slow, insecure technology and that operate with vast voids of information. Public health infrastructures have lagged behind the disease's spread. Government agencies have struggled to deliver rescue funding to small businesses facing mass extinction and to workers suddenly unemployed. At the same time, almost overnight, traditional activities have moved online, en masse -- office work, schoolwork, entertainment, grocery shopping, doctor visits, business conferences, concerts, dating, birthday parties, graduation ceremonies, Mother's Day. People and organizations with ready access to good digital technology have been resilient. Those without it, struggle.

Financial regulation is following this same arc. Before the pandemic, it too was moving toward digitization, albeit more slowly than the private sector. Regulatory leaders around the world have been exploring where and how to modernize their systems to leverage digital data. A small but growing community has formed of regulatory innovators. Their initiatives have been climbing the priority agenda at many agencies, gradually but with growing promise.

Now, suddenly, the pandemic is lifting these efforts to the top levels of urgency. Bank regulators must figure out how to conduct effective reviews offsite, and how to secure sensitive information as employees work from home. They must figure out how to get fuller information faster, just to understand the abrupt disruptions underway in the industries they oversee. They are contending with opacity -- the slowness and shallowness and narrow scope of traditional information sources like quarterly reports. State regulators are struggling with even more limited information about the nonbank companies they monitor, which now extend a large share of consumer financial services and which may face instability and novel risks.

World Wide Web inventor
Sir Tim Berners-Lee

As the financial marketplace rapidly adjusts to the pandemic, much about its activities and condition is invisible to the people charged with keeping the system stable and fair. Regulators simply have no way to see complete and real time information. Their systems are not digital.

Into this crisis, now, a second calamity has erupted. The police killing of George Floyd has ignited outrage and soul searching throughout America and the world. Like the pandemic, the tragedy has characteristics of a volcanic force that could change the landscape far and wide. In finance, the policy goal of financial inclusion, which has been explicit but unrealized for a half century, is gaining sudden energy.

Both the pandemic and the Black Lives Matter movement are motivating a search for better ways. Both have arrived at a moment when, for financial regulation, better is possible because of entirely new technology.

This Regtech Manifesto was written before either of these crises appeared. We believe that both of them make its arguments more urgent. We offer it, in fact, with hope that both, for all the damage and heartbreak they cause, may open a path to building a better financial regulatory system, and building it soon. The Great Plague of the 1300s killed one-third of the population of Europe. It also broke the feudal system, empowering workers and opening the way for emergence of a middle class. Crises stress old systems, which in turn allows new things to grow.

In presenting the paper as a Request for Comments, or RFC, we have taken inspiration from the origins of the World Wide Web. In 1989 -- just over thirty years ago -- British scientist Tim Berners-Lee invented the Web by converting the Internet, which had been created for defense and intelligence purposes, into an information system that could be used by everyone. Seeing the opportunity to merge very new innovation (the technologies enabling HTML and HTTP were just emerging) into a powerful new system, he convened a group of colleagues, began a dialogue,[1] and issued a paper in the form of a Request for Comments.

Financial regulation is a complex realm, but not as complex as connecting every computing device in the world to a platform for instant, free, interoperable communication and information access, meeting all the technical, legal and social requirements involved. Big change is possible when transformative technologies arise and when people cooperate to build interoperable frameworks that can put them widely to use.

Sir Tim has shared a photograph of his original paper on which a reviewer had penned this marginal note: *"Exciting but vague."* It is in the nature of such concept papers that early attempts to write down ideas will generate far more questions than answers. We hope this RFC will spark a dialogue that will vastly improve upon the nascent thinking we present herein.

We invite readers to provide comments to AIR at www.regulationinnovation.org/regtech-manifesto/ or by email at hello@regulationinnovation.org, to share the paper widely, and to generate their own forums for engagement.

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[1] Sir Tim has said, "I just had to take the hypertext idea and connect it to the Transmission Control Protocol and domain name system ideas and—ta-da!—the World Wide Web." https://www.w3.org/People/Berners-Lee/Kids.html

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EXECUTIVE SUMMARY

This "Manifesto" is intended as a seminal paper arguing that financial regulation, in the United States and globally, needs to be remade to equip regulators with the information and tools they will need to be effective in the Digital Age. The Manifesto strives to lay out why digital transformation is necessary, benefits it could bring, difficulties in designing it, attributes and principles that should shape it, and practical strategies for implementation.

> " If 'data is the new oil,' as the catchphrase goes, the financial regulatory system may soon be running low on fuel.
>
> — Alliance for Innovative Regulation

The core concept of the paper is a call for gradual but urgent redesign of the financial regulatory system to convert it from an analog approach to a "digitally-native" framework – that is, to a system that will be rebuilt from scratch, over time, to leverage new digital technologies that can make regulation better, faster and cheaper, all at once.

The umbrella term for regulatory technology is "regtech," sometimes spelled "RegTech." As used in this paper, the term covers *both* regtech for regulators (including so-called "Sup-Tech," meaning supervisory tech), and regtech for compliance. The Manifesto argues that the technology used for industry compliance should mirror the technology used by regulators, because they need the same core data and are performing two versions of nearly the same function. With limited exceptions, these streams of work should evolve together, in order to create an information ecosystem that is interoperable.

Financial regulators do their work by scrutinizing information about regulated companies and the environments in which they operate. Today, this information exists mainly in "analog" form, meaning in formats that were originally created on paper, like reports and spreadsheets. Most of this data is therefore locked up -- difficult to access and analyze. As a result, regulators must rely on limited information about the system. They analyze small samples of files. They read reports that often lag far behind present day. They draw on databases that are disconnected from other data sources, so that information cannot be readily pooled, and trends cannot be traced across large landscapes. The people charged with oversight of the financial system can see only a small fraction of what is happening in it.

This opacity has always produced challenges and occasional failures in regulation and risk management. However, failure risk is spiking today as the industry that is being regulated shifts to a digital model, itself. Financial services are transforming, driven by exponentially-changing technology that is revving up the velocity of all the activity in the system. The industry's products are digitizing, from loans to investment services. Its delivery vehicles are digitizing, shifting to online and mobile channels and into digital currencies. Its risk functions, from loan underwriting to actuarial analysis for insurance, are using new sources of data in new ways. Its "back office" functions are leveraging robotic processing and digital ledgers. Its customer service functions are using chatbots. Regulators will need digitized information and tools, just to keep up -- especially as they face innovation that is increasingly likely to be mold-breaking, such as cryptocurrency.

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All of this had created a compelling need for change, even before the COVID-19 pandemic hit the system. Suddenly regulators need to understand fast-moving trends. Where are risks erupting in commercial and agricultural lending sectors? Is commercial real estate at risk from the move to work-from-home? Will some small communities lose viability due to loss of their small business base? Is cryptocurrency use rising? Which international relationships present new challenges? Is more financial crime shifting online? Are lending programs disproportionately harming lower-income borrowers, women and people of color? These and many other challenges are skyrocketing, almost literally overnight.

> **If I take 30 steps linearly, I get to 30. If I take 30 steps exponentially, I get to a billion.**
>
> — Ray Kurzweil, Futurist

This Manifesto emphasizes the disruptive nature of exponential change, which appears to be gradual for long periods and then suddenly accelerates, often catching people by surprise at a point when it may be too late to respond to the forces at play. Regulators who rely on partial data, lagging reports and unscalable processes will increasingly find themselves unable to keep pace.

Futurist Ray Kurzweil illustrates exponential change by saying, "If I take 30 steps linearly, I get to 30. If I take 30 steps exponentially, I get to a billion." This means that regulatory functions will have to digitize as well, adopting regtech that can both strengthen the system and stem emerging high-tech risks.

The Stakes Are High

The financial system is the bloodstream of the economy and of a thriving society. A healthy flow of safe and easily-used financial services enables people to pay and be paid, to save and invest, to borrow, and to cushion and insure against risk. These capabilities then enable individuals, businesses and communities to flourish.

At the same time, financial services inherently generate critical risk exposures. These include the danger of systemic instability that can undermine national and global economies, as well as harm to customers, both for people who cannot access the system and for people who do.

Due to this blend of importance and risk, finance is regulated pervasively -- arguably more so than any other sector. In the United States, government oversees the financial services system to achieve four critical goals:

1. Financial and economic stability
2. Consumer protection
3. Financial inclusion
4. Combating financial crime

Today, new technology is opening an historic opportunity to do vastly better than has ever been possible on all four of these objectives. Innovation is driving down costs, opening electronic channels for serving people, expanding information and enabling powerful analytics across the whole spectrum of finance and financial regulation. As a result, there is a chance for nearly everyone to gain access to affordable financial services that can be provided, cheaply and profitably, through the mobile phone. There is a chance to enable sound lending to

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creditworthy people who are currently denied loans due to outdated underwriting techniques and risk models. There is a chance to make financial services understandable, and financial management easy. There is a chance to equip everyone with a safe and secure digital identity that opens up access to financial services and empowers consumers to control how their personal data is used and shared. There is a chance to protect consumer data from both security breaches and misuse by industry and governments.

There is also a chance to avert or contain the next financial crisis, and therefore, potentially, the next global economic collapse, including some of the worst effects of the COVID-19 pandemic.

Furthermore, digitized technologies have the capacity to turn back the rising tide of money laundering that funds terrorism and trafficking in weapons, drugs, looted antiquities, endangered wildlife and human beings, as well as exploitation of children for online sexual material.

However, the very same technologies that are generating these opportunities also carry risk of unprecedented harm to customers and destabilization of the financial system, if governments fail to anticipate and manage the problems that will emerge with them.

As technology transforms finance, regulation could become the single most important factor in how much it will produce good versus ill. Policymakers face a daunting responsibility to enable desirable innovation while at the same time preventing the novel dangers that will often be embedded in it. They will have to walk this knife's edge. They will, moreover, have to negotiate it at high speed.

Financial regulatory work is, everywhere and always, difficult, and will become more so as the system converts to digital form.

> **Finance and financial regulators have always been innovative adopters of new technology. In navigating the landscape ahead, experienced regulatory leaders will be uniquely situated to drive change. They will be the key players in the creation of a new regulatory paradigm.**

Regulators throughout the world are already seizing this opportunity, creating fresh thinking, new initiatives and momentum.

Drivers of Change

The single most critical force that is driving all this change is the digitization of information. The Manifesto covers digitization in some depth and describes the rapid digitization of the finance sector, specifically. It explores how this transformation is fueling two profoundly important and intertwined trends that necessitate a new regulatory approach. One trend is the explosion in the **volume of information** generated by and about the financial system. The second is the sharp **acceleration** in the pace of change. Both trends present unprecedented challenges for regulators.

Driver 1 — Explosion of Data

First, accelerating technology and digitization are producing vastly more information than ever before, at an ever-faster pace. Some experts now estimate that information may be [doubling every 12 hours](#). The data generated,

in turn, fuels still more technology advances, especially in artificial intelligence, generating a flywheel of change.

This means that financial regulators must prepare for the potential of becoming overwhelmed by the sheer volume of information impacting their work.

Former Bank of England Governor Mark Carney illustrated the data challenge facing regulators in a speech in June 2019. Explaining the need to employ artificial intelligence to identify the risks in today's financial markets, he said:

> ## It would be the equivalent of each supervisor reading the complete works of Shakespeare twice a week, every week of the year.
>
> - Former Bank of England Governor, Mark Carney

"The Bank now receives 65 billion data points each year of firm-related information. To put that into context, reviewing it all would be the equivalent of each supervisor reading the complete works of Shakespeare twice a week, every week of the year."[2]

Furthermore, the data being generated directly by financial companies is only a small fraction of the data being created about their activities and the environments in which they operate -- which is equally relevant to financial regulators. "Big Data" arises from sources like online activity, social media, published media, the internet of things (IoT), cameras, geolocation tracking, satellite imagery, digitized public records and much more. It is profoundly changing how regulators perform tasks like identifying risk trends and detecting fraud and financial crime.

It is humanly impossible to scale up traditional regulatory models to meet information challenges of this magnitude and velocity. As a result, until recently, most external information could not be leveraged by financial regulators. It wasn't readily (and affordably) accessible, and regulators also lacked the computing power to process it. Today, in contrast, we have almost infinite computing power enabling us to analyze limitless data using artificial intelligence (AI) tools like machine learning (ML) and natural language processing (NLP).

> **Joining ubiquitous data with AI creates the opportunity to completely redesign the system.**

Regulators will need to put these tools to use. They will need to see and understand the full set of information, rather than relying on data sampling and summary reports. They will need to see it in real time, not in periodically-submitted reports that lag months behind present day. They will need new tools that enable them to respond quickly to information and indicators.

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[2] https://www.bankofengland.co.uk/-/media/boe/files/speech/2019/enable-empower-ensure-a-new-finance-for-the-new-economy-speech-by-mark-carney.pdf?la=en&hash=DC151B5E6286F304F0109ABB19B4D1C31DC39CD5

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> "The FDIC was created in 1933. Banks of the last century looked very different than banks of this century and the banks going forward. And so our examiners and our examining model needs to adjust to that. No longer are we supposed to go in and take a look at a five-foot pile of papers at a bank. We're moving to more of a digital, remote file review where our examiners can do a whole lot more scoping and review in advance of going into the bank…If we can employ artificial intelligence and machine learning in our examining process, we would be able to…not look at a sample but examine the entire portfolio of loans…."
>
> **FDIC Chairman Jelena McWilliams 2019[3]**

While we are at a very early stage of learning how to put all this information to use, the confluence of growing data and accessible computational resources creates entirely new possibilities.

Driver 2 — Accelerating Technology

The second driver of regtech change is the acceleration of technology, which has opened a rapidly-widening gap between the linear pace of traditional regulatory activities and the exponential pace of technological change. Gordon Moore posited Moore's Law in 1975, accurately predicting that computing power would double every 24 months over the following decades. Today that acceleration is being fueled even further by rising deployment of artificial intelligence, a technology that has existed for over half a century but had limited utility until digitization
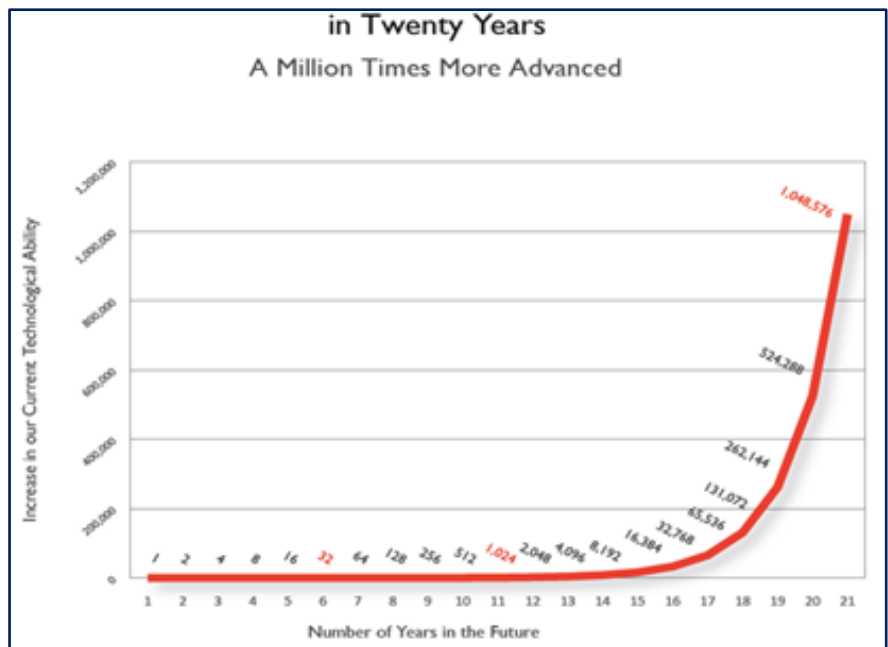
generated vast volumes of data to be analyzed and new types of chips were developed to analyze the data in new ways.

The Manifesto explores the difficulty of working in environments of exponential change which, again, present the appearance of gradual evolution for long periods until, suddenly, the curve turns sharply upward in a hockey-stick pattern. The phenomenon is illustrated in the figure above[4], which depicts Moore's Law.

Organizations that move at a linear pace in an exponentially-changing situation -- those that find themselves beneath this curve as it turns vertical -- may never be able to catch back up.

Nick Cook, who leads the innovation unit of the UK Financial Conduct Authority, told an FDIC audience in 2019

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[3] https://regulationinnovation.org/podcast/jelena-mcwilliams-chairman-of-the-fdic/
[4] From futurist Niv Dror, Medium, February 21, 2015

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that his agency had decided they must move forward with regtech despite the many uncertainties it raised. Waiting two years to try to figure it out, he said, could result in being ten years behind where they needed to be. "We realized that if we held still, we would be accelerating backwards."
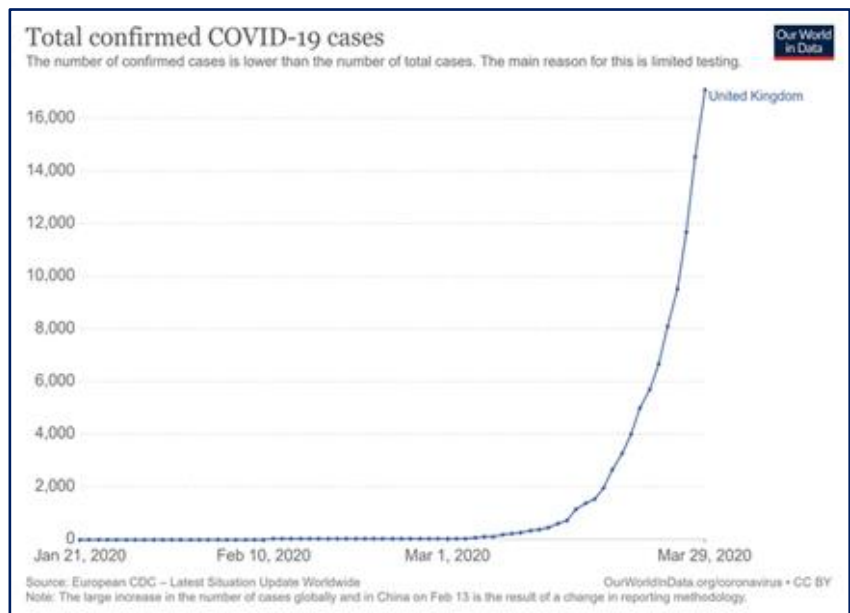
As an analogy, imagine that you own a pond on which lily pads have appeared and are doubling every day. After a month, you realize the pond is half covered and needs attention. When you return the next day, however, you find the entire surface filled with lily pads. What took 30 days to reach fifty percent needed only one more day to hit one hundred percent. That's because the growth is exponential.

Many things exhibit this pattern. Cancers, for example, often start slowly, giving patients ample time to address them, but then reach a tipping point at which intervention is too late. The lost time cannot be recovered. Or envision a train pulling out of the station. A passenger has a few seconds to jump onto it. After that, he cannot catch it. In 1859, an English farmer named Thomas Austin brought 24 rabbits to his farm in Australia. Just six years later, the continent had 22 million rabbits.

There is a novel by Ernest Hemingway in which a character is asked how he went bankrupt. He says, "At first gradually, and then suddenly."

The world has received a painful lesson in exponential change in 2020 from the COVID-19 virus, as illustrated in the graph beside on the growth of cases in the UK. In the United States, there were 26 new cases on March 4. Ten days later, the country had 662 new cases. Ten days after that, 9,939. Just two days after that, 17,050. Five days later there were 25,305. In the one-month period from March 4 to April 4, new cases surged from 26 to 33,725.

Total confirmed COVID-19 cases
The number of confirmed cases is lower than the number of total cases. The main reason for this is limited testing.

Source: European CDC – Latest Situation Update Worldwide
Note: The large increase in the number of cases globally and in China on Feb 13 is the result of a change in reporting methodology.

The Manifesto contrasts the speed of exponential technology growth with the traditional pace of regulatory change and lays out the need to accelerate the latter. The shift will be difficult. Despite its history of innovation, our regulatory system is, and is supposed to be, risk-averse. It is meant to be deliberate, measured and careful, all of which makes it move at a relatively slow pace. Its culture of carefulness has generally served us well, but will not be sustainable in a system where the activities being regulated are mutating too fast for the regulators to understand and respond to them. *Regulation will have to find ways to speed up.*

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What is Digitally-Native Technology?

It is worth noting that these two forces -- data growth and technology acceleration -- are also converging with a third trend that is demographic. Millennials are the largest generation in the history of the world, in the United States and globally. Its front edge members are turning 40. By sheer force of numbers, this generation will increasingly dominate economic and cultural activity, and they are all "digitally-native."[5] They have never lived in a non-digitized world. This means they will bring new technology expectations to their organizations as they assume leadership roles in industry and government that were formerly held by older "digital immigrants." Their impact will accelerate digital change in both the financial industry and its regulatory bodies. [6]

This difference between being "born digital" versus adapting to it from a non-digital starting point applies to technology as well as to people and is a key point of the Manifesto. The paper argues that conversion to a digitally-native system is entirely different from merely "automating" existing methods by layering technology on

Projected population by generation

In millions

Note: Millennials refer to the population ages 23 to 38 as of 2019.
Source: Pew Research Center tabulations of U.S. Census Bureau population estimates released April 2020 and population projections released December 2017.

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top of analog-era processes to speed them up. Instead, this transformation will gradually create something truly new -- the "digitally-native" design we would adopt if we could start with a clean slate and use today's vast data and powerful analytical technology, which did not exist when the current systems were put in place.
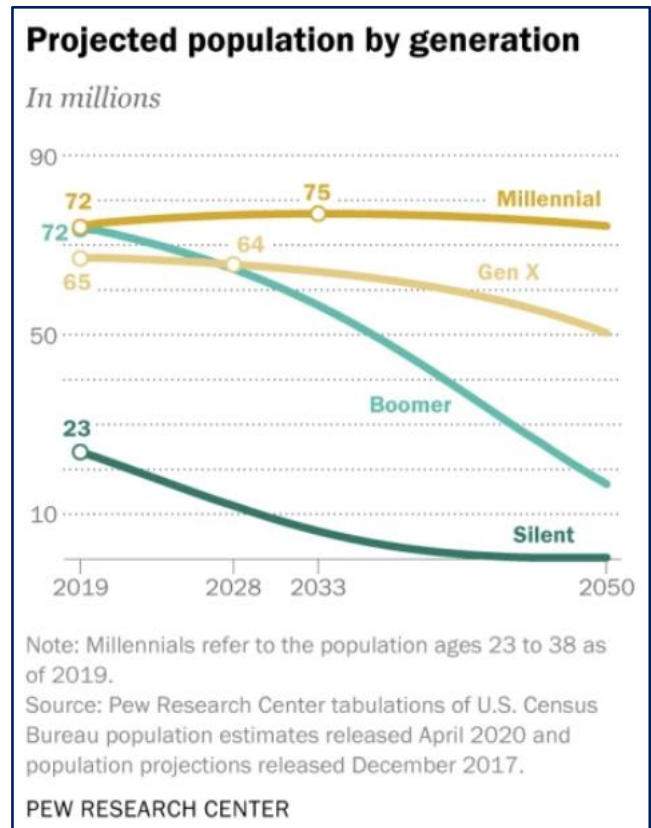
Systems that are born digital have inherent advantages over those that graft digital capabilities onto older technology. Generally speaking, they are faster, less expensive, more adept at leveraging data and more agile in learning. If properly designed, they can also be more secure. Importantly, they are much easier to update to keep pace with new technologies and other factors. They improve continuously, rather than periodically.

This distinction between analog-era and digital-era technology is akin to how smartphones differ from the telephones and film-based cameras that preceded them. *The change is not evolutionary. It is different technology, operating in an entirely different way.*

Opportunity and Risk

The Manifesto discusses the fact that all of these technology trends are both negative and positive.

On the negative side, the digitization of both finance and financial regulation will create new problems, even as it solves many old ones. Likely difficulties will include potential system instability; potentially exploitative business

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[5] https://www.cnn.com/2012/12/04/business/digital-native-prensky/index.html
[6] https://www.pewresearch.org/fact-tank/2020/04/28/millennials-overtake-baby-boomers-as-americas-largest-generation/

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models; heightened cyber risk; threats to consumer privacy; adoption of AI that reflects and spreads bias; and challenging shifts in legal responsibility as the financial industry's structure continuously evolves. Regulators will be expected to protect the system and the people using it from very novel[7] developments that simply transcend the "boxes," break the molds in which traditional regulatory work has been placed. Products are emerging that do not fit neatly into current legal frameworks, sometimes leaving it unclear even what laws apply and what regulatory bodies should oversee new activities.

On the positive side, conversion of the regulatory system to digital design will create an unprecedented opportunity to *improve outcomes and drive down costs at the same time*, opening the potential to reap huge gains in meeting often-intractable public policy goals. For example, regulators around the world are seeking to expand financial inclusion by leveraging technology like mobile phone-based services and digital identity. They are finding new digital tools to combat financial crime. They are exploring a range of potential systemic benefits, such as helping to level the playing field between large financial providers versus community banks and small innovators. There is exploration of a move toward "outcomes-based regulation" in some areas, creating the potential that agencies may be able to reduce system costs by assessing companies' data against desired performance metrics, because it will become possible and practical to measure them.

> **"….using old technology is not less risky than using new technology. This thinking is a mistake…Behavioral economists will tell you that there is such a thing as status quo bias and that the human brain tends to overweigh the safety of the known versus the unknown. And yet, I think we all know that airbags are way safer than not. Modern airplanes are way safer in the main than old airplanes. Faster chip computers crash a lot less often than old chip computers. At some point, we need to get people comfortable with the idea that the reason that there's a market for innovation, the reason the tech stocks do well...is because generally speaking, they're more reliable, not less.**
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> Brian Brooks, Acting Comptroller of the Currency, May 2020[8]

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[7] The 2019 announcement that Facebook and a group of other companies planned to launch the Libra cryptocurrency served as an alert that current regulatory structures may be mismatched to cutting edge financial innovation.

[8] https://regulationinnovation.org/podcast/the-first-fintech-comptroller-acting-comptroller-of-the-currency-brian-brooks-on-his-first-day-in-office/

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OVERVIEW OF THE MANIFESTO

This Regtech Manifesto is a Request for Comments published by AIR, the Alliance for Innovative Regulation. It will be the first in a series of papers that will explore specific challenges in greater depth.[9] The Manifesto has been ideated and refined by numerous stakeholders including current and former regulators and innovators on the frontiers of technology. We hope to engage a growing community of leaders in embracing and shaping a digitally-native regulatory paradigm, and to equip changemakers in all types of organizations with a common language and shared concepts for engaging their colleagues and each other.

Readers of the Manifesto will explore how and why conversion to a regtech system is needed, why it requires new rather than modified technology, how it might be designed, and how regulators could accomplish such a complex transformation given the practical constraints on their activities. On the last challenge, reviewers are invited to consider two "Roadmap" strategies, one for agencies seeking incremental change, and the second a bolder approach that could accelerate impact.

The Manifesto envisions that a full regtech transformation will take years to implement -- decades, in some areas -- and also that it will never be fully "implemented" in the sense of stabilizing in finished form. Rather, the need for innovation will accelerate permanently. This means that innovation culture and skill will have to suffuse the regulatory system's DNA.

Despite the lengthy time horizon, the paper argues that it is urgent to begin work on redesign now. The gap between technology change and regulatory change is widening every day, filling with risk.

The Manifesto has five main sections, which we have called Explorations. Each section ends with questions on which we hope to elicit comment. The Explorations are followed by two Roadmaps that distill the material into step-by-step action guides.

The Conclusion poses a range of questions about the paper overall. The document also contains appendices, including an overview of currently-active regtech use cases drawn from the US and around the world.

The paper's five main sections are:

1.   The Problem -- Why Financial Regulation Must Change
2.   The Solution -- Digitally-Native Regtech
3.   Design Challenges in Building a Regtech System
4.   Principles and Attributes of a Regtech System
5.   Practical Strategies for Converting to Digitally-Native Design

Below is a brief overview of the paper.

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[9] Note that this paper focuses on financial regulation but addresses many issues that also apply to other highly regulated sectors, such as medicine. The paper's scope emphasizes regulation in the United States but is grounded in the robust regtech work already underway throughout the world.

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Exploration 1: The Problem -- Why Financial Regulation Must Change

The paper's first section lays out the case for transformation, focusing on three complex, interrelated problems that open the conversation about why change is necessary.

1. Acceleration: The paper posits that the speed and scale of today's revolution in technology and data will make traditional financial regulatory systems increasingly vulnerable to failure.

2. Effectiveness: The Manifesto argues that current regulatory systems have a mixed record of achieving their policy goals and could do substantially better by adopting digital technology.

3. Efficiency: The paper suggests that today's system imposes high costs that harm both the financial industry and its customers, and that these could be reduced dramatically without compromising outcomes (and could, in some areas, improve them).

The Manifesto also argues that change is urgent and discusses the likely risks and problems of *not* adopting digital tools. It identifies a category of rising threat to the financial system, in the form of "legacy risk."

Exploration 2: The Solution -- Digitally-Native Regtech

Section 2 explains how digitally-native regtech can remedy the three problems described in Section 1. It includes:

1. Explanation of regtech: This section explains what regtech is and how it works. It includes definitions and how the Manifesto uses the terms "regtech" and "suptech."

2. Explanation of digitally-native design: The paper explains the concept of digitally-native versus digital-immigrant skills, technologies and organizations.

3. Benefits of converting to a regtech system: This section describes potential benefits, including containment of rising systemic risk, enhanced consumer protection and financial inclusion, reduced financial crime, greater competitiveness for community banks and small firms, lower regulatory costs, more innovation, more competition, and progress, where appropriate, toward measurable outcomes-based regulation. The benefits include improved results for specific regulations, improved effectiveness of regulatory efforts overall and desirable secondary effects.

A key benefit would be the ability of regulatory systems to achieve continuous improvement electronically, in something like the way an iPhone regularly pushes out automatic updates and security patches, as opposed to issuing updates periodically in forms that require extensive work, expense and time lags to implement.

Exploration 3: Design Challenges in Building a Regtech System

This section lays out the thorny challenges that would have to be resolved in designing a regtech system (as opposed to the challenges of implementing one, which are covered in Section 5).

One set of challenges revolves around data and analytics. These include how regulators and risk managers will access data, how to set standards for data quality and interoperability and difficulties that will attend the necessary transition of industry and regulators to cloud computing environments. This section also discusses the many complex issues involved in adopting AI for regulatory and compliance purposes, including the issue of "explainable AI."

Data-related design challenges will also arise in regulators' increasing use of external "big data," to supplement information that comes from the firms they oversee.

A second set of regtech design issues focuses on converting the core regulatory framework from closed, centralized systems to a horizontal "platform" architecture that enables interoperability, modularity, flexibility and continuous improvement. Challenges here include the need to prevent "vendor capture" by enabling use of varying solutions on the envisioned modular platform.

Design considerations must also address legal and ethical challenges. Preeminent among these is the need to protect privacy. A new system must also think through the potential that greater regulatory access to company information could shift legal liabilities to the government when problems and failures arise.

The final arena of design factors centers on cost considerations, in terms of both transition expenses and ongoing operating costs.

Exploration 4: Principles and Attributes of a Regtech System

The Manifesto's fourth exploration describes what a digitally-native system would look like, suggests principles that should guide its design and describes attributes that should be built into it.

In terms of principles, the paper argues that the system must be ethically grounded, legally sound, provide for secure and permissioned use of data, and capable of continuous improvement. A new system must also be adoptable by the industry, cost-justified, risk proportionate and clearly additive to the strengths of the current one. It should strive to produce outcomes that are measurable. Where appropriate, changes should be developed through technology testing.

The system's attributes should include being data centered, AI and API enabled, cloud-based, platformed and interoperable, machine-readable, design-centered and agile. In key areas it should be based on open source computer code, be decentralized, leverage blockchain technology, be metrics-driven and outcomes based, and be machine-executable.

Exploration 5: Practical Strategies for Converting to Digitally-Native Regulation

Transforming this complex system will be extremely difficult. The paper's final section examines in some depth what the main implementation challenges will be and recommends practical methods for addressing them.

The Manifesto suggests that regulators have two strategic options. One is for agencies that want to explore regtech change incrementally. The other is for those that want to embark on an agenda of rapid learning and accelerated conversion.

The paper lays out recommendations in these areas.

1. Getting started and basic planning: This section begins by suggesting simple ways to get started and how to link the conversion effort to normal change management methodologies, as well as how to infuse new tech-driven elements into them.

2. Structural strategies: The paper suggests options for combining or otherwise connecting agency teams that work respectively on regtech/suptech, fintech innovation, data science and conversion to cloud computing. It argues that these functions will have to work together on the regtech undertaking.

3. Culture: The Manifesto cites input we received from numerous regulators that culture change, or the lack thereof, will make or break any regtech conversion. The paper describes the cultural attributes of financial regulatory bodies and suggests strategies for preserving powerful positive features while also enabling faster learning and action. This discussion includes focus on the critical role, at bank and credit union agencies, of engaging senior supervisory leaders.

4. Talent and organizational strategies: The paper takes up talent strategies, including how to recruit technology people into regulatory settings, how to train existing staff, and for bank regulators, the importance of fully engaging field examiners. It also discusses how to update HR systems to create paths and leadership roles for people, including millennial employees, who have technology skills.

5. Acceleration strategies -- testing: The Manifesto argues that implementation success will require two major strategies for speeding up regulatory work. The first is adoption of testing and trial and error as a major method of learning and shaping decisions. This section discusses how to set up regulatory labs or accelerators, the need for hackathon-style regulatory "tech sprints," and ideas for creating safe spaces for both agencies and companies to conduct experimentation. The paper urges regulators to proactively encourage industry testing as a universal process.

6. Acceleration strategies -- collaboration: The second suggested acceleration strategy is a massive expansion of agency collaborative methods and relationships. Internally, this will mean softening silos and adopting the "agile" cross-functional team-based workflows that are ubiquitous in the technology world. Externally, it will include a major scaling up of both interagency collaboration and interaction with industry, drawing lessons from models that are working well in other countries. International collaboration is covered as well.

   The paper suggests the necessity of agencies seeding and cultivating a regtech "community of practice."

   The Manifesto argues that the single most critical step is to get technology experts into "the room where it happens" as regulatory policy is developed and decisions are made. It suggests that this is the primary missing link.

7. Sequencing strategies: Exploration 5 suggests sequencing strategies for introducing regtech. One is to build on successful initiatives already taken by other regulators, which can both reduce risk and uncertainty and save time.

Another is to start with very small, concrete initiatives, even as the agency frames out a larger strategic vision. The paper calls this, "thinking big but starting small." Regulators find it helpful simply to start *somewhere* -- almost anywhere -- and to begin to accumulate team learning and confidence, build out methodologies, create community, and develop insights on what to do next, based on each incremental step.

Sequencing strategies also include, for some areas, introducing a regtech channel as an *option* for businesses, allowing them to choose it voluntarily if desired. Essentially, the agency would create a second, tech-based alternative for certain regulatory functions. This could reduce opposition and friction and conversion costs and open the opportunity to grow new approaches organically, learning from experience. Over time, if the regtech methods are clearly superior, the older approaches may wither away.

The Manifesto suggests other sequencing approaches as well.

8. Legal and ethics strategies: The paper identifies legal and regulatory barriers to innovation for both the financial industry and the agencies themselves and suggests plans for addressing them. It also encourages development of explicit ethical principles to guide decision making in sensitive areas where innovation may get out ahead of clear legal requirements.

9. Cost management: The Manifesto identifies the key cost factors to consider, in terms of impacts on both industry and government, and for both transition expenses and ongoing ones.

Roadmaps

The Manifesto is offered as an RFC rather than as a finished blueprint for building a new system. Given the scope and complexity of the material, however, this final section strives to distill the paper's discussion into a simple, adaptable step-by-step framework that regulatory bodies might use to organize and guide a conversion project.

The paper offers a basic version suited for pursuing incremental change. It also offers a second option with two additional strategies, for agencies that may want to move more boldly and achieve quicker and more scalable impacts. These are:

1. Integration of banking, fintech and regtech: The first high-impact strategy would be an aggressive program to foster integration of banking, fintech and regtech. It would be premised on the concept that the financial sector, and its customers, would benefit from an easier flow of technology into the mainstream financial services industry, including banks, and that one key driver of such an integration would be removal of regulatory barriers that currently impede it. Action steps would center on the bank chartering process, treatment of bank third-party risk management and the issue of "vendor capture."

2. A "Moonshot" project: The second impact strategy would be to launch the regulatory version of a "moonshot" project in which an interagency task force or similar body would commit resources to building the new system over the next 3 to 5 years, laying out vision, infrastructure, technology standards and governance.

This project could be undertaken by creating a Federally Funded Research and Development Center, or FFRDC, for this purpose. Under existing law, one or more federal agencies can initiate an FFRDC to undertake R&D for them, and this entity can also accept funding from outside parties. Such a structure could simultaneously solve for many of the practical obstacles to building a new system, including collaboration needs, experimentation needs and resources.

Appendix on Regtech Use Cases

The Manifesto's appendices include one describing regtech use cases that are already deployed or under active development by regulators (and some by the private sector as well), in the US and other countries. These include numerous tools for anti-money laundering and curtailing financial crime; for Know Your Customer compliance and digital identity; and for countering fraud, including synthetic identity.

Use cases also include machine-readable regulation and "digitizing the rulebook;" machine-executable regulation that enables automated self-implementation; digital regulatory reporting (DRR); preventing "phoenixing" and "cockroaching" (bad actors reestablishing themselves in the market under new names); and use of chatbots for handling and analyzing complaints. Extensive regtech development is also underway for monitoring securities markets through AI to detect potential misconduct.

Other appendices provide a guide to abbreviated terms and agency names, offer information on additional regtech resources and thank the many people who contributed their thinking to this paper.

Exploration 1
THE PROBLEM -- WHY THE SYSTEM MUST CHANGE

The United States has an extensive, sophisticated and often innovative financial regulatory system intended to achieve four goals:

- Financial systemic stability
- Consumer protection
- Financial inclusion
- Detection and prevention of financial crimes like the funding of terrorism

Using the technology available in the past, the system has generally performed well against some of these objectives and has been less effective, and sometimes ineffective, in addressing others. In some areas, it has produced harmful unintended consequences.

In addition, these mixed results are achieved at high cost, which further undermines success on some of the goals.

These limitations and failures are rarely the fault of policymakers and regulators, but rather reflect, overall, the best that could be done with the technology of the past.

> **These limitations and failures are rarely the fault of policymakers and regulators, but rather reflect, overall, the best that could be done with the technology of the past.**

This section of the Manifesto lays out three reasons why this legacy system must now be modernized using the technology of today. They are:

- *Acceleration*: The current system is ill-suited to meet the challenge of accelerating technology and proliferating data.
- *Effectiveness*: Today's system underperforms in achieving its four policy goals, due to technology limitations.
- *Efficiency*: The system is inherently inefficient, again due to aging technology and reliance on manual processes.

Subsequent sections of this paper will explore how to solve all three problems, and also how to manage the transition challenges and risks that would accompany a system redesign.

Problem 1: Accelerating Technology and Explosion of Data

Over decades and even centuries, finance and financial regulation have actively adopted technology innovation. This history creates a temptation to view the change underway today as part of a long pattern of evolution in which the system will be able to absorb needed change through traditional mechanisms.

However, today's situation is different. A bank executive at a conference in early 2019 put her finger on the new factor. She said that her twenty years in finance have been defined by never-ending change, but that now there is a new dynamic. As she put it, *change, itself, has changed: it has speeded up.*

This acceleration is being driven by the exponential rate of growth in computing power and the technology innovation it enables. That force is affecting virtually every aspect of life. It is a particular challenge in the financial sector because financial services are being so rapidly digitized. The services offered in the financial realm are mostly intangible, which means they can be created, delivered and supported easily through electronic means. In order to oversee the emerging digital products successfully -- and even to understand them -- regulators will have no choice but to digitize as well.

Regardless of how well the system currently performs, it is not designed to keep pace with the technological change that is transforming the financial industry. Most banking in the US is now done online. Mobile banking is spreading rapidly, riding the wave of near ubiquity of mobile phones – since at least 2013, more people in the world have had access to mobile phones than to toilets.[10]

> " Since at least 2013, more people in the world have access to mobile phones than to toilets.[10]

Financial products are being transformed by digital technology. Payments are being reinvented through innovations like Venmo and cryptocurrencies such as Bitcoin and potentially Libra. Investment is changing due to robo-advice and crypto assets.

Lending has moved onto marketplace platforms and is transforming through mobile loan approvals, income-smoothing credit offerings and use of cash flow data in underwriting to supplement credit scores. Online lenders are serving very small businesses with small loans -- too small to be profitable for most banks. Small business payments and lending are both transforming due to the introduction of the Square Reader, which has equipped merchants to accept electronic payments at point of sale on a mobile phone, thus in turn enabling these small enterprises to digitize their records effortlessly, opening doors for credit access. A similar breakthrough has also come from Stripe's innovations in online purchases. Customer identities are being digitized, easing account onboarding and creating the potential to protect sensitive personal data in new ways. Saving money is becoming easier due to services that use AI to automatically set aside funds and motivate consumers to build a financial cushion or save for goals. Financial management is becoming easier, too, automatically assembling and analyzing budgets, managing bill-paying and tracking progress toward meeting goals. Voice technology is helping accelerate that trend.

Policymakers will find it challenging to oversee beneficial developments like these. They will face a constant risk of accidentally throttling them in the cradle, by moving too slowly or by viewing them through traditional lenses that may no longer be appropriate.

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[10] http://newsfeed.time.com/2013/03/25/more-people-have-cell-phones-than-toilets-u-n-study-shows/

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At the same time, regulators will also be at risk of failing to regulate these novel products enough or properly, since all these positive innovations are being accompanied by negative ones. Regulators and policymakers must contend with the rising danger of cyber-attack and privacy failures. They must figure out where and how AI and machine learning should be allowed into the system. They will need to understand AI bias and create standards or rules to identify and prevent it from distorting financial processes and producing discriminatory decision-making.

Financial regulators face the daunting task of needing to move, now, to address exponential change underway in the companies they oversee. Regulators throughout the world increasingly recognize that they are standing at the bottom of the hockey-stick curve and will have to figure out how to change fast enough to match it. Many are concluding that, as discussed above, it has become riskier to hold still than to move forward – even if they are unsure exactly what to do. The reason is that the delta between that exponential rate of technology change and the linear pace of normal change is widening and rapidly filling with novel risks. Every time a gap opens up between market innovation and regulatory responses, the lag will only grow, simply because linear systems cannot catch up to exponentially-paced ones.

Regulation will lag ever-further behind unless the regulatory system can, itself, achieve exponential rates of change.

This kind of thinking will need to be applied to every segment of regulators' work. Agencies will need to accelerate how they monitor what is happening in markets; how they analyze risks and trends; how they seek input on new policy; how they develop policy; how they make decisions on matters like enforcement; how their actions are communicated, implemented and overseen; and how all of the above is managed, where needed, with high levels of interagency consultation. They will face the regulatory equivalent of fixing an airplane while flying it.

> **The ability to digitize rule-sets and consume, process, and analyze data in real-time could very well be the capability that allows us to explore application of so-called "agile regulation." Rather than rely on static rules and regulations that were put in place without knowing exactly the consequences or results they would drive in the market, we may be able to actually measure data, real-world outcomes, and success in satisfying regulatory objectives.**
>
> **-Then-CFTC Chairman Christopher Giancarlo, 2018[11]**

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[11] https://www.cftc.gov/PressRoom/SpeechesTestimony/opagiancarlo59

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Importantly, the technology revolution that is underway will be raising the risk in the financial system at the same time it is reducing regulators' ability to see the full picture of market activity. Financial companies, and banks specifically, are likely to experience tech-driven disruption that could trigger problems ranging from loss of market share to rising cybersecurity exposure. Meanwhile entirely new kinds of problems may emerge. Of course, the need to speed up will not reduce regulators' responsibility to get things right. They will not be able to meet the acceleration challenge by lowering standards for risk management or for assuring fair competition and fair treatment of customers. Instead, they will need new ways to do both, better. These will be explored further below and also in later papers in the Manifesto series.

> "
> We always overestimate the change that can occur in a year, and underestimate the change that will occur in ten. Don't get lulled into complacency.
>
> — Bill Gates

Problem 2: Longstanding Limitations of the Current System

Even if the regulatory system was not facing the stress of accelerating technology, policymakers would still be wise to prioritize the question of how digital innovation could improve upon existing performance. Measured against the four policy goals – systemic stability, consumer protection, financial inclusion and combating crime – the performance of the legacy system has been uneven. Again, it can be argued broadly that the results are the best that have been possible in the past using the analog-era tools that have been available. It is clear, however, that they are not the best that could be produced using the tools of the Digital Age.

In-depth analysis of the current system's performance against the four enumerated goals is beyond the scope of this paper, but is explored extensively in academic literature and briefly summarized below.

On the goal of maintaining financial stability, the US regulatory system has generally had a good track record, although serious failures like the 2007-2008 financial crisis still break through.

Regarding the goals of consumer financial protection and inclusion, the record is mixed. As I explored in a series of papers as a senior fellow at the Harvard Kennedy School Center for Business and Government,[12] little effort is made today to measure the outcomes of these regulatory policies, but extensive evidence suggests that they are not achieving high levels of success. Millions of consumers are harmed by interactions with the financial system for a variety of complex reasons. Millions also are unable to access or afford mainstream financial services despite having demonstrable capacity to meet standards. An FDIC study found that one in every five US households is unbanked or underbanked,[13] forcing them to rely on high-cost financial services.

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[12] https://www.hks.harvard.edu/centers/mrcbg/publications/awp/awp110,
https://www.hks.harvard.edu/centers/mrcbg/publications/awp/awp111
[13] https://www.fdic.gov/householdsurvey/2017/2017execsumm.pdf

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Other studies estimate that 80-135 million Americans are financially underserved, resulting in their paying approximately $40,000 in unnecessarily high rates and fees over their lifetimes.[14] A Brookings Institution analysis found that funds of this kind could generate up to $360,000 in wealth at the point of retirement if well-invested.[15] A 2017 article in *The Atlantic* made headlines by citing a Federal Reserve finding that nearly half of Americans do not have $400 in savings to cover emergency spending needs.[16]

Regarding the fourth regulatory goal – combating financial crime – there is broad consensus that current policies are both expensive and ineffective. The United Nations reports a 99 percent failure rate in the system as a whole in catching global money laundering. This occurs despite the financial industry spending tens of

> The United Nations reports a 99 percent failure rate in the system as whole in catching global money laundering.

billions of dollars annually complying with anti-money laundering regulations. The UN estimates that financial crime now exceeds $1.6 trillion annually.[17] It is rising, not surprisingly, because this perverse confluence of high profits and low risk of detection makes it ever-more enticing to criminals, and also because criminal and terrorist rings are using increasingly sophisticated technology, accessing consumers' data on the dark web without privacy constraints, and out-performing the tools of the financial industry and law enforcement.

Many factors contribute to ineffectiveness in all four of these arenas. The sheer complexity of the financial regulatory system makes it impossible for human brains to navigate all the mandates and revisions. Complexity also contributes to ambiguity, as rules and policies sometimes conflict with each other. Both of these factors, in turn, discourage innovation. They also chill competition, as venture capital firms often avoid entering financial services for fear of regulatory difficulties that cannot be fully envisioned and managed.

As noted above, another factor contributing to regulatory ineffectiveness is a lack of metrics regarding whether some regulatory policies are achieving their intended results, and how well the regulated firms are actually performing against regulatory standards. In some areas, regulators evaluate the performance of regulated firms mainly by

> " At over 638,000 words, the (Prudential Regulation Authority) Rule Book is longer than War and Peace. It is also somewhat less interesting and infinitely more complex.
>
> - Former Bank of England Governor, Mark Carney June 2019

reviewing the quality of their efforts to comply. As discussed below, this approach tends to be expensive and has a mixed record of effectiveness. It contrasts with other regulatory realms in which government sets and enforces quantitative and measurable standards that industry is able to perform against. Examples are water or food quality, or automobile and air travel safety, where failures do occur but are generally rare enough to be newsworthy. Digitized information has the potential to enable more aspects of financial regulation to become

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[14] The movie Spent

[15] https://www.brookings.edu/research/banking-on-wealth-americas-new-retail-banking-infrastructure-and-its-wealth-building-potential/

[16] https://www.theatlantic.com/magazine/archive/2016/05/my-secret-shame/476415/

[17] https://www.unodc.org/unodc/en/money-laundering/globalization.html

subject to clear, quantitative standards that could produce higher compliance and better outcomes.

> "
> In another ten years anything that AI doesn't power will seem lifeless and outmoded. It will be like an icebox after electric-powered refrigerators were invented.
>
> - Hemant Taneja, Unscaled

As new technology increasingly enables better company performance and better risk management, regulatory expectations and standards can be expected to rise. In some areas, performance levels that are today considered satisfactory and even strong are likely to be seen as unacceptable. Bank supervisors have begun to talk about "legacy risk," citing concerns that tech-backward institutions are incurring risks that could impact their safe and sound operation and their compliance in areas like anti-money laundering. The good news is that as the industry adopts better tools, relative costs should also decrease, as discussed in the next section.

Problem 3: High Costs of the Current System

Regulatory costs in the financial realm are high, for both government and industry. Compliance expenses are notoriously difficult to measure because they saturate virtually every facet of industry activity, but there is no dispute that they are a major factor in financial industry costs, profitability, pricing and even competitiveness. Global compliance costs for banks alone are estimated to be at least $100 billion.[18] [19] In 2015, *Notre Dame Law Review Online* published a study entitled "The Failure of Anti-Money Laundering Regulation: Where is the Cost-Benefit Analysis?" The authors said, "To a large extent, the fight against financial crimes has swallowed up the core business of banking, such as providing loans and banking services."[20] Financial regulations are projected to reach over 300 million pages in 2020.[21]

> **Financial regulations are projected to reach over 300 million pages in 2020.**

Compliance costs are disproportionately high for small banks. One Federal Reserve Bank of St. Louis study estimated them at 22% of net income.[22] A study that I co-authored with Indiana University as long ago as 1992 found compliance costs amounting to nearly 20 percent of bank operating expense, for just four regulations.[23] Regulatory costs are so high that many view them as threatening the future of community banks. They also are often cited as a barrier to innovation.

The cost problem is linked to the regulatory ineffectiveness problem described above, because getting better risk and compliance information out of analog systems is expensive. Too often, parties must choose between spending

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[18] https://letstalkpayments.com/a-report-on-global-regtech-a-100-billion-opportunity-market-overview-analysis-of-incumbents-and-startups/

[19] https://www.thetradenews.com/Sell-side/Banks-spent-close-to-$100-billion-on-compliance-last-year/

[20] https://scholarship.law.nd.edu/ndlr_online/vol91/iss1/4/

[21] https://techandfinance.com/2016/04/20/financial-regulations-will-surpass-300-million-pages-by-2020-says-jwg/

[22] https://www.stlouisfed.org/on-the-economy/2015/december/compliance-costs-community-banks-billions

[23] Common Ground: Increasing Consumer Benefits and Reducing Regulatory Costs in Banking, by Barefoot, Marrinan & Associates, Inc.; Dr. Anjan V. Thakor, and Mr. Jess C. Beltz, Indiana University, 1992.

more for better results, or conserving funds and settling for lower quality and higher risk.

Periodically, efforts are undertaken to reduce regulatory costs to industry. Some of these are legally mandated at intervals, and others are undertaken by Congress and regulatory officials. Rules are reviewed. Obsolete ones may be eliminated. Processes may be streamlined. Reporting may be automated. Over the long arc, however, there is little or no evidence that meaningful reductions have occurred and been sustained through these kinds of methods. Sometimes, deregulatory cost-cutting actually backfires, if problems balloon in their wake and new leaders arrive and install new rules to address perceived failures. Each time new rules are adopted, new costs must be incurred both to convert to them and to maintain compliance. This Manifesto argues that the only way to achieve meaningful and sustainable regulatory cost containment or reduction is to adopt digitally-based technology that sharply reduces manual processes and, importantly, that enables continuous and easier updating of both policy and regulatory content going forward.

Exploration 1 / The Problem
Questions for Commenters:

- Is the case for regulatory modernization clear and compelling? If not, what arguments are unpersuasive? Which issues are most salient, and why?

- Have we omitted other major drivers of change?

Exploration 2

THE SOLUTION -- DIGITALLY-NATIVE REGTECH

For many years, the limitations of the current regulatory system have been "baked into" the expectations of the regulatory community. People can see the system's constraints and costs, but assume that not much can be done to address them -- at least not without sacrificing important policy goals. The new element changing that calculation today is new technology. Digitization will make it *necessary* to do better as the system accelerates, and will make it *possible* to do better, on both new and longstanding challenges. It will also enable these enhancements to be realized at lower overall costs. The net results can help meet the goals of all the stakeholders in the ecosystem, whether their main concern is financial stability, consumer financial health, financial crime or regulatory expense.

> "
> Technology will always win.
> You can delay technology by legal interference, but technology will flow around legal barriers.
>
> - Former Intel CEO, Andy Grove

This convergence of interests, in turn, could create the collective will to digitize the system, despite the obstacles to doing so.

This section explains digitally-native regtech and how it can solve the challenges laid out in Exploration 1.

How Financial Regulation is Done Today

All three of the problems described in Exploration 1 -- accelerating technology change, failures of the current system, and costs of the current system -- have a common root cause: *the people managing financial regulatory systems, both to regulate and to comply, do not have enough, and good enough, information*. Much of the information they have is partial, based on sampling and/or on limited reports. Much of it is also lagging behind real time. As a result, large swaths of the system are opaque, because information about them is not digital and cannot interface with other data.

As noted earlier, even if analog systems have been automated, they function with workflows that were originally designed on paper, decades or centuries ago, and that still bear the fundamental design of how information was transmitted in the past. This produces a linear flow, in which information must move in sequential steps, much as it did when a document was physically written or typed on paper and then dropped in the mail or filed in a metal cabinet.

Consider the information that forms the raw material used by bank regulators. A typical financial process flow starts with a customer transaction. Documents are created. These are given or sent to customers and to databases. They are reported and pooled. Pooled information is reviewed to check for regulatory noncompliance and risk. Problems are spotted and investigated and corrected. Corrections are documented and disclosed to regulators, auditors, and sometimes to customers. Results are audited and are examined by the government. When a regulatory report is required, the bank draws on its databases, creates the report, and sends it to its

regulator, or, if the situation involves financial crime, to a law enforcement agency. Many reports used by supervisory agencies are periodic or require considerable time to prepare, which means that, by definition, the information in them lags behind real time and therefore may be obsolete before it reaches the government reviewer.

The regulator or law enforcement entity receives the report and evaluates it along with other information -- which, as discussed earlier, is proliferating. The government entity may send back a request for clarification or further information. The company generates this response and sends it back to the regulator...and so on.

At each step in these processes, information becomes stranded in hard-to-access information bases. Each step introduces time, cost and chance of error. Delays enable harm, such as unseen rising risk or failure to catch a crime in progress. Each step causes loss and deterioration of information. Most require human handling, even for highly mundane tasks.

All this means that reviewers, both in the government and industry, cannot easily see emerging risks until these have become fairly widespread and severe. They cannot readily find compliance mistakes. They cannot reliably know whether creditworthy people are being unnecessarily denied loans based on traditional risk scoring systems that do not fully measure financial capacity. They cannot easily detect signs of rising systemic risk, such as how the spread of subprime mortgages was contaminating the mainstream financial system before the 2007 crisis. They see only a narrow slice of potential financial crime, while the large-scale patterns of major criminal networks operate in ways that are mostly invisible.

If agencies try to improve results by requiring more or faster information, costs rise further.

Even where these processes have been automated, they still bear this basic linear design. Since they were created in the analog age, they reflect the constraining assumptions of that era – that both data and computing power are scarce and expensive, and that therefore processes must be designed to make do with limited and lagging information. In the digital age, however, data and computing are both abundant and cheap – more so every day.

> **Even when old processes are automated, they still reflect the constraining assumptions of that era – that both data and computing power are scarce and expensive, and that therefore processes must be designed to make do with limited and lagging information. In the digital age, however, data and computing are both abundant and cheap.**

Digitally-native systems can now bypass this traditional linear design and make information almost infinitely and instantly usable, at a fraction of the cost of past practices. This is not about layering technology over old processes. It is about complete digital redesign that can reduce intractable risks in the current system; reduce systemic costs that harm financial customers and markets; and, most urgently, equip the system to deal with the accelerating change that is racing toward it.

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What is Regtech?

The term for the digital technology emerging in financial regulation is *"regtech"* or "RegTech."[24] The word is widely used with two meanings.

First, it refers to "regtech for regulators," versions of which are often called supervisory tech, or "suptech." Second, it also denotes technology for use by the financial industry to comply with laws and regulatory rules.

> **These two streams of regtech -- one for the regulator and one for the industry as they work on the same core problems -- are mirror images of each other. They share the same kinds of technologies, rooted in common sources of digitized information and data flows.**

Today, many bank regulatory agencies are developing proprietary suptech, driven in part by a desire to create their own technologies rather than relying on private vendors that sell similar services to the banks for compliance purposes. While regulators undoubtedly need some unique tools, it will also be important to think of general "regtech" and "suptech" as a linked body of innovation, for several reasons.

First, if regulators' suptech efforts evolve as a different branch of work, the ultimate system may not be efficient and effective in building ready data access, data standards and interoperability. These will be essential to creating a Digital Age system.

Second, "suptech" is generally a subset of regulator-driven regtech that is specific to *bank* regulators, because these agencies play the unique role of directly "supervising" deposit-taking institutions. Depository institutions -- banks, savings banks and credit unions -- are subject to higher scrutiny than other financial companies because they hold the public's checking and savings deposits and because these are insured by the federal government.

Regulatory bodies that oversee nonbank entities, like mortgage and finance companies, money transmitters, securities firms, insurance companies and fintechs, generally do not *supervise* them in the sense meant in the lexicon of the regulatory realm. As regulatory, but not "supervisory," agencies, they generally require less reporting and monitoring information from their nonbank firms and conduct less expansive onsite examinations. If suptech develops independently of other regulatory technology, valuable synergies could be lost between bank and nonbank regulatory activities. System interoperability would be limited, as would the ready ability to update the full system to new, better technology over time. Scoping regtech systems and techniques widely enough to cover both banks and nonbanks holds great promise for improving oversight of nonbanks, which play a growing role in the financial services marketplace.

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[24]The term "regtech" evolved from the earlier coining of the term "fintech" to refer to new-generation, high-tech financial services and processes. Fintech innovations include specific products like marketplace lending, cryptocurrency, robo-advising, and money management apps. Fintech also covers many technologies that span a wide spectrum of financial products, delivery channels and back office functions, such as mobile banking and lending, numerous blockchain use cases, and activities that leverage artificial intelligence techniques like machine learning and voice recognition technology. "Fintech" has also spawned other derivative terms, such as "InsureTech."

The third reason for framing suptech as a subset of regtech is that financial regulation will increasingly evolve to encompass the leveraging of external "big data," in addition to internal and reported data. Many regulators, especially those overseeing securities markets, are already

advancing rapidly on using such information to detect risks in the system through AI. This form of "regtech" should be integrated with supervisory efforts, rather than fenced off from it.

While these terminology issues are still evolving, we urge widespread adoption of "regtech" as the common umbrella term for all subsets of regulatory technology used by both regulators and regulatees, including "suptech" and "comp-tech" or "comply-tech," terms that are sometimes used to refer to compliance technology.[25] If well designed, these streams of innovation will converge over time into efficient, effective and interoperable new systems used by government and industry alike.[26]

The Appendix lists a variety of use cases for both regulator-driven and private sector regtech that are emerging or are being implemented already. In most of these areas, both government and industry are actively building solutions, usually separately.

What is Digitally-Native Regulatory Design?

The term "digitally-native regulation" derives from the concept of "digitally-native consumers," meaning consumers who were born after the arrival of the Internet and have never known a world not dominated by digital technology. Extensive research shows that digital natives grasp technology much more readily than do "digital immigrants" who must, in effect, learn these technologies as a second language. The term conveys the powerful point that with technology change, it is often easier and more effective to start from scratch, in parallel with current systems, than to "bolt" new technologies on top of old ones.

Consider an analogy – photography. In the analog age, we took pictures with cameras using film, had them developed, and then paid for any additional prints or editing. Today, we take a photo with a mobile phone or digital camera that instantly converts the image into digital information.

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[25] Innovation initiatives by regulators generally address two distinct but overlapping challenges. The first is the question of how best to regulate the rapid innovation underway in finance, usually called *fintech*. Most of the "regulatory sandboxes" that have cropped up across the world aim to answer this question by enabling regulators to look closely at new kinds of products and practices to determine whether they meet current regulatory requirements and if not, whether perhaps the regulations need updating. A second realm of regulatory innovation focuses not on how technology is changing the industry, but rather on how it should change the regulators, themselves, and also the compliance management systems used by the industry to meet regulatory requirements. This is *regtech.* What data should regulators and risk managers collect? How should they collect it -- for instance, through periodic reporting or through an API interface? How should information be analyzed in an era of artificial intelligence? Both of these arenas of regulatory modernization are driven by the same underlying technology shifts, including the explosion of data and adoption of artificial intelligence, and they need to be closely connected.

[26] It is worth noting that not every compliance tool that is labeled as "regtech" is digitally-native. The breakthrough technologies discussed in this Manifesto have digitized data at their heart and leverage digitally-enabled technology trends such as artificial intelligence (including machine learning), cloud computing, and blockchains and distributed ledger technology (DLT), among others. As "regtech" has increasingly become a buzzword in compliance technology, it is becoming common to see it attached to older, analog tools.

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> **Consider an analogy – photography. In the analog age, we took pictures with cameras using film, had them developed, and then paid for any additional prints or editing. Today, we take a photo with a mobile phone or digital camera that instantly converts the image into digital information.**

As a result, we now have a digital object at our fingertips, giving us a vast range of easy options for using it. We can edit it, crop it, label it, tag it and group it with other photos and other material. [27] In seconds, we can put it to a limitless array of additional uses. We can post it to social media, or text or email it to someone, or print it. We can drop it into a letter or report. We can embed it in a slide. We can upload it in seconds to a service that will print it to our specifications so that, when we open our mail a few days later, we have a framed photograph ready to hang on our wall. We can also search for it, along with enormous sets of other data, to find patterns into which it may fit.

This digital photo is instantly and easily usable. It is available on equipment we already have. It is usually accessible in all those devices, immediately. It is always findable, identified with its time and location stamp. Furthermore, working with it requires no special skills and no specialized machinery. Anyone can do all this with virtually no training.

Importantly, reusing the photo in all these ways also generates virtually no marginal cost. A complex set of activities is underway in putting the picture to use, but for the user, the process is close to being cost-free, instant and effortless.

This is the future of financial regulation. Financial companies will generate the needed information in digitized forms that are easy and inexpensive to create, to share and to analyze. They will use this data for their own risk management and, where appropriate, will make it accessible to their regulators, often in real time and as complete data sets. As discussed later, these information systems will be fully "interoperable," so that data can automatically flow across varied systems.

Regulators will be able to aggregate and analyze all this data for each regulated entity and, importantly, across the industry. They will also be able to combine it with external big data reflecting trends and risks. Using artificial intelligence (AI) and its branches in machine learning (ML) and Natural Language Processing (NLP), they will be able to find system-wide patterns that may signal compliance failings or emerging problems, at a very early stage before widespread harm can occur and before major liability accumulates to the industry. They will also be able to find valuable bits of information that would otherwise have been hidden like needles in haystacks.

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[27] I recently searched my Google Photos for pictures of a family member. Google's facial recognition software immediately brought me a full set -- except that one was a photograph of the wrong relative. On closer scrutiny, I realized the individual in that image was standing in front of a bookshelf, on which sat a tiny framed picture of the person I was looking for.

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> **Digital regulatory work could have pattern-matching tools analogous to the fingerprint scanning technology used in criminal investigations. It would be impossible for a human investigator to compare an individual print to the universe of fingerprints in the database. A machine can do so in minutes, saving time and pointing toward avenues that merit investigation by human experts whose time is precious. In much the same way, regulators will be able to look for patterns of emerging systemic risk or financial crime.**

Eventually, regulators and risk managers will be able to query data in much the way we currently Google a question, on virtually any topic about which they are entitled to information, and will instantly receive the answers they need. Importantly, data-driven systems will not replace expert human risk managers and regulators. Rather, the new tools will empower them with much more and timelier information, and with profoundly better analytic tools than they have today.

Exploration 3 will discuss the potential risks and problems that will arise with this kind of system, including the need to restrict access to data and otherwise protect information.

How Can Digitally-Native Regtech Improve Finance and Financial Regulation?

Converting the system to digitized design could produce across-the-board gains against all the challenges facing financial regulators. The section below describes how these impacts would benefit the financial system and its customers on three dimensions. The first set of benefits relate to improved results for *specific* regulatory objectives. The second addresses improvements in the *overall* effectiveness of regulatory efforts. The third set describes *indirect* benefits that these improvements are likely to engender.

Gains against the specific regulatory objectives

The following are impacts that regtech could have on the four specific regulatory goals enumerated in Exploration 1 -- financial stability, consumer protection, financial inclusion and countering financial crime.

Improved financial system stability
Regtech could sharply enhance the likelihood of averting financial crises by equipping regulators with vastly better and more timely data and with AI-based analytical tools that monitor trends and risk patterns. Agencies could understand more deeply both the financial companies they oversee and the larger environment in which these operate, in the US and globally.

It is not unrealistic to think that, if a fully digital regtech system had existed in the early 2000s, regulators might have been able to prevent the financial crisis and, therefore, the Great Recession. That approach could have detected early risk trends and interrelationships among companies that became apparent only after massive damage was done. Furthermore, a system through which all of the industry's complex loan terms and securitization structures had been created using a digital standard, rather than being trapped in paper files in warehouses, could have enabled regulators to accurately model the risk that was accumulating. Similarly, the impacts of the COVID-19 pandemic on the financial system could be managed far better, today, if regulators had more and better windows into the rapid changes underway throughout the system.

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Expanded financial inclusion

The digitization of finance is driving unprecedented gains in financial inclusion, and regtech will be needed both to optimize its impacts and to address the problems it may bring.

The single greatest driver of expanded financial inclusion is a technology -- the advent of the mobile phone as a delivery platform. This is arguably the most democratizing force in the history of finance. Globally, it has opened the doors of the formal financial system to hundreds of millions of people for whom, almost certainly, no one was ever going to build and staff a bank branch. In the US, it is revolutionizing how people at all levels of wealth and financial sophistication deal with money. The same is true for other digital innovations. One example is the use of alternative data for loan underwriting for people who lack traditional credit histories but are nevertheless creditworthy.[28] Another is the move to faster, easier payments that can reduce the need for consumers to rely on checking account overdrafts and high cost payday loans for the purpose of filling lags in when their funds, such as paychecks, are credited.

Regulators will need technology-based information and tools to oversee these rapid shifts, so as not to inadvertently choke off desirable innovation and also in order to counter related risks. The latter include potential systemic destabilization, a rise in online predatory practices, loss of privacy and security, and new methods of financial crime. Agencies will require scalable regulatory systems, using digital regtech that gathers and analyzes much more information, with high efficiency and velocity.

The second digital driver of inclusive finance arises from regtech itself (and related compliance solutions) that are driving down system costs and eliminating barriers to access. These include digital identity solutions that can enable people easily to prove who they are, which they must do in order to be allowed to access the formal financial system under the regulatory requirements that financial companies must "Know Your Customer" (KYC).

Reduced regulatory overhead could make it practical and profitable for financial providers to serve many families and small businesses that are not widely deemed to be desirable customers today because the cost of serving them -- including the regulatory cost -- is too high in relation to the profitability of their accounts.

This link between compliance costs and financial inclusion is not always intuitive,[29] but has sparked major efforts worldwide. It is noteworthy that much of the international work on regtech has been driven by organizations whose mission is to widen financial access. Entities like the Bill and Melinda Gates Foundation, the Omidyar Network, and Omidyar's affiliate Flourish Ventures[30] have backed a variety of initiatives with this mission

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[28] A new nonprofit called FinRegLab (of which I chair the board of directors) released noteworthy research on this opportunity in 2019. https://finreglab.org/cash-flow-data-in-underwriting-credit-empirical-research-findings

[29] As noted earlier, I am publishing a series of papers developed during a senior fellowship at the Harvard Kennedy School Center for Business and Government, exploring in more depth how regulatory modernization can unlock major gains in financial inclusion.

[30] Flourish ventures has given a grant to AIR

in mind. One example is support for launching the Regtech for Regulators Accelerator, or R2A,[31] which has also received assistance from USAID and Rockefeller Philanthropy Advisors, and which has helped several countries institute regtech initiatives. Similar work is underway at the World Bank, the United Nations, the International Telecommunication Union, and the Alliance for Financial Inclusion, or AFI, which consists of central banks and financial regulators of nearly 100 countries in the global south. There are also many inclusion initiatives by individual countries. The Gates Foundation has funded an initiative at the University of Michigan, headed by former Assistant Treasury Secretary Michael Barr and former White House fintech advisor Adrienne Harris, to explore the future of central banks, driven in large part by a financial inclusion focus.

Enhanced consumer protection and financial health

The same system improvements that drive financial inclusion can also enhance consumer protection and "financial health." Once consumers have been "included" in the financial system in the sense of having access to an affordable financial account, they need to be able to use this access to manage their financial lives -- to save, budget, insure against risk and the like. Both incumbent providers and new entrants are making it easier for consumers to make sound choices and to manage the complexity of financial products. Here again, regulators will need regtech capabilities to track changes in the market so as to permit or facilitate desirable innovation and, where appropriate, to set guardrails around new technologies that could threaten consumer wellbeing, before extensive harm can be done.

> **Once consumers have been "included" in the financial system in the sense of having access to an affordable financial account, they need to be able to use this access to manage their financial lives -- to save, budget, insure against risk, and the like.**

Reduced financial crime

Exploration 1 described the 99 percent failure rate of today's efforts to catch financial crime. A digitally-native regtech system could massively improve these outcomes, and extensive work toward that end is already well underway.

Digitization almost always improves results for any activity that operates by moving, using and understanding information -- the functions that are the very essence of regulatory and compliance activity. Some of this improvement flows from the reduction in costs described above, which simply frees up resources so that human experts can work on higher-order risks and accomplish more in a day's work.

Beyond this, outcomes are improved because the digitized information enables people to see any situation more fully, clearly and quickly. For regulators, it could become easy to look at data across companies to detect money laundering trends or outlier behavior that may signal market misconduct.

Consider the example of a bank that submits an anti-money laundering Suspicious Activity Report (SAR) to FinCEN. The bank has a great deal of information about this case. It may have, somewhere, records like ATM video footage, copies of the customer's identity documents, and detailed information on the size, timing, and location of transactions, as well as relationships between the customer and other parties. Today, when a bank sees suspicious

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[31] https://www.r2accelerator.org/

activity, it files a SAR, using a PDF or a batch reporting process that transmits only a fraction of this information to law enforcement. The latter reviews the report, along with high volumes of others. If the SAR looks interesting, the agency requests more information. At each step of this interaction, time is lost, and sometimes information is lost or compromised as well -- for instance, video footage may be erased. The process is akin to taking the robust data the bank has in hand and feeding a tiny amount of it to government officials through a straw. FinCEN and law enforcement are blind to most of the information about the case.

In a digitized system, instead, law enforcement could have access to nearly full digitized data about each case (subject to appropriate limitations). They would be able to analyze it using machine-learning tools that can find common typologies of financial crime and that enable human investigators, who generally have scarce resources, to home in on high value scenarios. Information on the patterns of new crime typologies could then be shared back to the industry, continuously, so that criminals would be increasingly unable to run the same scams on different companies in a sequence over weeks or months.

Converting to such a system would require work on security, privacy and authorized access, as well as on impacts on human capital, including migrating people from roles involving data entry to more intensive analytical work. Such efforts are already well underway at regulator and law enforcement agencies around the world.

General impacts on regulatory effectiveness

Below are benefits that regtech could bring to overall regulatory effectiveness and efficiency, across the board.

Heightened overall compliance

Current compliance technology makes it very challenging for even the most diligent companies to meet regulatory requirements. It is difficult, if not impossible, for a bank or financial company to be completely compliant with all rules at all times under the current system, due to the complexity of the regulations and, again, to the limitations of analog compliance tools. At any given time, there is likely to be considerable noncompliance in the system that has not been identified. This means risks may be percolating, and consumers may be experiencing harm. Some of this harm will never be redressed.

Regtech systems can enable risk managers to gain much fuller visibility into their systems, use AI to detect patterns of emerging risk or biased decision making or misconduct, and correct problems, raising the overall level of compliance throughout the financial world.

Earlier detection and correction of problems

A related regtech benefit could be earlier identification of problems. Today's regulatory system tends to be backward-looking. Regulators receive reports depicting activities and events that have already happened, sometimes long ago. In addition, some problems develop beneath the surface, growing like icebergs in which only a fraction of the danger is visible. When systemic or widespread problems break into view, the whole regulatory realm can become consumed by retroactively-focused activity. There are still sections of the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act, for example, that have not been implemented, a decade on.

Better, fuller, faster information would enhance the ability to catch problems earlier. This in turn would reduce risk exposure for both the industry and its customers, as well as compliance costs (discussed below).

Improved oversight of nonbanks

A perennial challenge in financial regulation is its bifurcated treatment of banks versus nonbanks. Depository institutions -- banks and credit unions -- are subject to pervasive government "supervision," mainly because they hold federally-insured customer deposits and so are examined to protect both depositors and the government's insurance funds. Meanwhile, tens of thousands of large and small non-depository companies offer financial services, ranging from payday and mortgage lending to transmitting money. Some of these are licensed by state governments and most are overseen in some way by the states. They are generally subject to the same legal requirements as banks in areas like consumer protection, and they often have regulatory reporting obligations, but they do not routinely undergo regular and onsite examinations.

While most of these companies strive to comply with the rules, it is perhaps not surprising that many questionable practices tend to take root in this less-supervised sector, and that it also attracts outright bad actors that can be difficult to detect.

It is not practical to apply full bank-style oversight to these non-bank companies, due to their sheer numbers and volume of activity. However, regtech can bring marked gains for governments' ability to monitor these markets for problems. For example, regulators in the Philippines have experimented with chatbots that enable complaints to be filed with them straight from consumers' mobile phones, inexpensively generating data on patterns of problems to investigate.

Similarly, digitized regulatory reporting can make it feasible for nonbank companies to provide reporting data to regulators at low cost. Such innovation could help governments understand critical trends in these nonbank sectors and to protect consumers who become vulnerable to harmful treatment in the "shadowed" corners of the financial system.

Nonbanks, including fintech firms, provide a growing share of financial services. Regulatory authorities will need better and timelier information about them, and will need to obtain it cost-effectively. Regtech could solve this problem.

Increased regulatory speed and agility

The exponential rates of change in finance will, in effect, funnel more and more of the financial system's activities into an opaque zone in which the regulators cannot observe accurately what is happening. If not modernized, their tools could become equivalent to managing air traffic control at a major airport, without radar.

The improved information systems in digitally-native regtech could radically improve this situation. In addition, regtech systems should be married with other tech world techniques that can speed up agencies' ability to learn and act. One of these is "agile" workflow structures in which cross-functional, highly collaborative teams concentrate on solving problems together, rapidly, with intensive focus on measuring results and iterating solutions. In the regulatory world this design would offer tremendous advantages in the ability to generate a constant process for identifying small errors, thereby preventing the kind of crisis failures that occur when problems accumulate, undetected. Agile workflow will be discussed in Exploration 5.

> "Agile methods began appearing in the early 1990s as the software industry exploded. In 2001, software development leaders met to discuss shared ideas and various approaches to software development. By the end of that meeting, they had written the Agile Manifesto."
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> – Study.com

Capacity for continuous innovation and improvement

A key advantage of digital systems is that they are able to improve continuously, rather than periodically as is the case with analog era IT. It will not be sufficient to effect an overhaul that merely trades an old, rigid set of activities for a new, equally rigid one. A one-time upgrade that locks in inflexible technologies and protocols will inevitably become obsolete again, ever more rapidly as change in the financial industry speeds up. As that new system then falls further and further behind the market's technology, risks and costs would rise again until another overhaul becomes unavoidable. At that point, the whole system would lose even more ground as agencies invest time in evaluating and implementing the next update -- which, if rigid, will only set the negative cycle in motion yet again.

Regtech can switch the system to a stance of continuous improvement. This will likely require that many regulatory functions migrate from closed, locked analog systems onto platforms. Regulators would build and foster platforms that enable modular, plug-and-play solutions in which both they and the industry can select from a range of vendors or develop their own technology for specific solutions, with confidence that these will interact properly with other tech.

Digital technology maintained on a platform can be updated easily and automatically, without the need for linear processes in which change requires major IT projects. In some areas, new regulatory requirements or software upgrades could be pushed out to systems automatically, much like an iOS update on an iPhone. Such a system would of course present its own challenges, which will be examined in Exploration 3.

Modularity

A key facet of continuous improvement and platforms is the need to create regulatory and compliance systems that can be modular.

A move to modularity is underway in financial services, themselves, in the drive toward "open banking" in many countries. Financial accounts are being made interoperable, so that customers can use a variety of financial products from a variety of providers, and have them all work together, under the customer's control.

A similar shift is needed in regulatory processes, where a key difficulty is the rigidity of much of the technology in use. Because compliance tools and systems are not very interoperable, companies are often unable to adopt the best new technology. Conversion is expensive and time-consuming, and sometimes it is literally impossible to connect better tools to legacy systems. This means much of the industry is using suboptimal compliance solutions.

A regtech system would solve this problem by creating standards and interfaces that make it easy for companies and regulators to adopt a new tool on a modular basis, and have it readily work with the existing system.

As an analogy, consider the App Store. Like Apple, regulators could set standards that would have to be met by any vendor seeking to provide compliance services to industry. These would include requirements for data

security, privacy, fair treatment, auditability and the like. Developers who want to create an iPhone app download a Software Development Kit, or SDK, from Apple and build according to its specifications. When those are met, the solution automatically meets Apple's standards and will work on any iPhone or iPad.

Even a few months ago, the notion of a regulatory App Store seemed like a vision for the far-distant future. However, in June of this year, ING Bank and partners have launched one, to help regtech firms collaborate in offering packaged services to banks. Their project, Orchestrate, "is helping RegTechs to collaborate more to create more meaningful propositions."

Opportunity to develop outcome-based regulation
Many areas of financial regulation lack good metrics to assess regulatory and compliance performance. Every law and regulation comes into existence to achieve some kind of policy goal, but in finance, it is often not possible to know how well these goals are being met. Do consumers really understand the financial choices that disclosures are meant to illuminate? Is the financial system serving customers without bias? Is government gaining or losing ground in combating financial crime? While research sometimes occurs on such questions, many current regulatory mechanisms do not attempt to evaluate them.

Instead, financial regulatory strategies usually fall in one of two categories. One is "rules-based" regulation (for example, prescribing detailed disclosures that must be given to consumers in specific formats). The other is "principles-based" regulation, such as broad prohibitions on unfair and deceptive practices or, for banks, high-risk commercial lending, that are assessed against subjective standards.

Each approach has pros and cons. Rules-based systems tend to be prescriptive and detailed and therefore burdensome, but generally have the virtue of clarity. Principles-based systems usually impose fewer burdensome processes, but are inherently subjective and therefore, uncertain.

Uncertainty is a perennial issue in regulation. Some regulatory theory intentionally encourages ambiguity in order to create risk for regulated firms that may be tempted to edge up to the "line" on activities that could be construed as illegal. However, uncertainty also can deter behavior that policymakers actually want to encourage. It can chill innovation, which often generates activity that may not fit squarely into current regulatory frameworks. It can also discourage financial companies from serving markets where regulatory uncertainty and potential penalties are both high. From a financial inclusion standpoint, lenders sometimes avoid trying to serve lower-income consumer segments. For example, they cite the ambiguity of standards for assuring compliance with the ban on even unintentional "disparate impact" discrimination, and for avoiding unfair, deceptive, or abusive acts or practices (UDAAP).

Regtech offers the potential to capture the best of both regulatory philosophies, in the form of performance-driven or outcomes-driven regulation. Robust data could make it possible to monitor and measure companies' performance against clear, objective metrics that regulators would establish and communicate. The standards would be designed to determine whether companies are meeting their obligations relating to the purposes of the regulations involved, whether managing market risk or avoiding credit discrimination. This approach would not work for all areas of regulation, but where appropriate, could reduce compliance burden. Regulators would in effect be saying that they need not prescribe *how* a company must meet a regulatory goal, as long as the firm can

prove through data that it has actually done so. The companies, in turn, would have objective, measurable standards to aim for, rather than being vulnerable to second-guessing based on subjective principles.

In consumer finance, for example, it could become possible for regulators to set measurable standards to assure that a given product is producing beneficial consumer outcomes. Suppose a lender could show, through data, that its product does what it promises, at the promised pricing; that the product's profitability does not rely on income from penalty pricing; that the provider has no record of other unfair treatment of customers; and that customer complaints show no signs of unfair product design or practices.

Regulators across the globe are exploring more use of outcomes-based strategies.[32] These have the potential to find more problems, sooner, than using today's analog systems. New systems would potentially function in ways more akin to use of monitoring gauges on a drinking water supply, rather than evaluating whether a municipal water/sewer agency is properly adhering to a regimen of required inspections and maintenance and relying on manual quality control and testing.

> **New systems would potentially function in ways more akin to use of monitoring gauges on a drinking water supply, rather than evaluating whether a municipal water/sewer agency is properly adhering to a regimen of required inspections and maintenance.**

Efficiency
A final across-the-board benefit of regtech could be sharply improved efficiency. Much of this impact would come from simply removing frictions and disconnects that make the current system rigid and slow and therefore expensive, as discussed above. In addition, regtech would benefit from adoption of open source computer code, which would enable regulators and industry alike to avoid having to "reinvent the wheel" as they individually solve common problems. Open source will be discussed in Explorations 4 and 5.

Major gains in efficiency will enable both regulators and industry to do more with less, freeing up scarce human skills and producing stronger results in compliance and risk control across the landscape.

Indirect benefits from improved regulation

Better regulatory methods and effectiveness could also generate secondary benefits, beyond meeting specific policy goals and making regulation generally more effective.

Reduced need for corrective action and fines
An important ancillary benefit of early detection would be sharply reduced costs to both regulators and industry due to a reduced need for large-scale retroactive corrective action, as well as reduced penalty fees to industry. If

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[32] The Financial Health Network (FHN) provides a useful example of outcomes-based policy. FHN created a Financial Health Score, which is a composite metric that measures specific consumer financial health outcomes, including spending behavior, amount of savings, credit history, and planning for retirement. Through 8 discrete questions, FHN can determine the financial health outcomes of consumers. While FHN is not a regulatory body, the organization is increasingly tracking these metrics before and after policy-interventions to help determine their effectiveness. In cases where regulators can articulate the desired outcomes for the user-base they seek to impact and define the key performance indicators of those outcomes, they may be able to incent industry to innovatively meet those goals.

bank risk managers could detect and shut down problems immediately, they could break long standing patterns in which issues accumulate over years and then, when discovered, trigger enormous remediation projects. Even if a company misses one of its mistakes, regulators using regtech tools would be likely to catch it -- again, at a very early stage in which correction would be easy and any potential penalties to the bank could be minor.

This ties to the benefits of regtech in reducing costs. Regulatory "look backs" triggered by enforcement actions and litigation are a major compliance expense for industry and regulators alike. Banks have spent billions of dollars since the financial crisis on legal and consulting fees aimed just at identifying all the errors made over prior years and finding the customers who were affected. On top of this, they have paid tens of billions of dollars in fines, relating both to the financial crisis and to other noncompliance like anti-money laundering weaknesses. Systems that could find and fix mistakes while they are still small would transform regulatory risks and associated costs.

Reduced burden and brighter prospects for community banks
Cost reductions could be especially helpful to small banks, which today spend disproportionately high amounts on compliance. This in turn could move dramatically toward levelling the compliance playing field between community banks and their large competitors. That impact could be invaluable to the future of community banking as a sector, which experiences regulatory burden as a key driver of cost and as a brake on innovation and technology adoption.

Regtech that permitted new data for loan underwriting could also enable a strategy for community banks to "grow in place," by using technology to expand their potential market vertically. It could become possible to reach and serve more customers who are now deemed to be too risky or expensive to be profitable using traditional techniques.

Enhanced innovation and competition
The same factors that would help community banks could also benefit other small companies, including startups in the financial sector. While venture capital funding for regtech has risen sharply in recent years, anecdotal evidence indicates that high regulatory costs and risks deter many such investors from entering the financial space.

These barriers also prevent many startups from partnering with banks, even though banks and startups have highly complementary strengths and weaknesses that make it attractive to both sides to work together. Existing regulatory expectations on managing third-party risk make it very hard for digitally-native firms to work with banks. This problem could be reduced as regulators develop regtech labs or sandboxes and set standards for evaluation of digitally-native partners, using better data on risk. Such changes could, in turn, enhance market competitiveness.

> **The gallows humor among fintech and regtech firms is that bank third-party risk due diligence reviews are where "startups go to die." The process can take months or more than a year, draining the resources of these small companies as they wait for approval.**

Enhanced competitiveness for the United States

Modernizing financial regulation could also strengthen the positioning of the United States in global financial innovation. While Silicon Valley and other US innovation corridors continue to generate world-class technology, there is also widespread concern that the US financial regulatory environment makes it difficult to innovate here, in comparison to other countries. It has become common to hear US fintech founders say they are launching or expanding their firms in other countries, due to regulatory complexity in the US.

This is partly because America has a uniquely complicated regulatory structure, with numerous federal agencies plus 50 state bodies. Regardless of how good these regulators are, their processes are relatively slow in areas that require interagency collaboration. In addition, the existence of multiple, sometimes overlapping agencies drives industry uncertainty about questions in areas where US regulatory entities may disagree with each other, or may even just be perceived as having the potential to disagree.

Other countries have been more proactive than the US in establishing regulatory strategies that actively encourage fintech and regtech innovation. They often are able to move faster and to problem-solve more easily.

> It has become common to hear US fintech founders say they are launching or expanding their firms in other countries, due to regulatory complexity in the US.

Ending the tradeoff between better outcomes and lower costs

Regulation and compliance have traditionally been locked in a zero-sum standoff in which policymakers must choose between having better results or achieving lower costs. They can either require the industry to spend more in order to produce better outcomes, or can try to reduce spending at the risk of undermining quality. Debate rages as political forces advocate for more versus less regulation and as governments periodically try to reduce burden through analog-style reforms, usually with negligible or unsustainable results.

Digitization reverses this pattern, enabling a win/win scenario in which results can be made better and cheaper, at the same time. The opportunity to push up value and push down costs simultaneously creates a chance to generate widespread support for undertaking the work and transition costs of converting to a digital system.

For example, it has been estimated that about 80 percent of the time financial companies spend on investigating suspected financial crime goes into collecting the information needed (often by copying and pasting into spreadsheets). In a digitized system, this would be done automatically, freeing up expert analysts

> The opportunity to push up value and push down costs simultaneously creates a chance to generate widespread support for undertaking the work and transition costs of converting to a digital system.

to search for actual patterns of laundering. Similarly, it is widely estimated that current AML monitoring technologies produce a 90 percent rate of "false positive" cases, each of which requires hours of investigation. A modernized system could potentially reverse that ratio, reducing wasted time by 90 percent while also cutting the "false negatives" -- finding crime that currently goes undetected. This opportunity to get better results through

technology with fewer resources exists throughout the system and, again, opens the possibility of building consensus and depoliticizing some aspects of policy debate about financial regulation.

Exploration 2 - Regtech as the Solution
Questions for Commenters:

- Are the regtech benefits outlined generally clear and persuasive? If not, which ones fall short?

- Are any major benefits omitted from the list?

- Do some potential benefits point toward strategies for prioritizing and sequencing work on converting to a regtech system?

- Are there some benefits that seem highly likely to outweigh the costs of adopting them and conversely, some for which conversion costs seem likely to be excessive?

- Do you know of research and data to amplify this outline of potential benefits, or that may counter it?

Exploration 3

DESIGN CHALLENGES IN BUILDING A REGTECH SYSTEM

The previous section explored benefits that could accrue from converting to a regtech system, over and above the defensive argument that the risks of *not* digitizing will likely exceed the risks of doing so, as the pace of technology accelerates.

This section explores the many thorny problems that would confront policymakers if they choose to build a digitally-native regtech system. It focuses on difficulties relating to the actual *design* of such a system (as opposed to the equally thorny challenges of actually implementing it, which are addressed in Exploration 5).

The basic technology needed for a regtech system already exists and operates every day in mature and reliable form throughout the economy. However, applying these technologies to financial regulatory work will be difficult. Designers will have to address unique issues that are rife with sensitivity and complexity.

> The basic technology needed for a regtech system already exists and operates every day in mature and reliable form throughout the economy.

These challenges are explored below, and then Exploration 4 will lay out the design attributes and guiding principles that will be needed to overcome them. Despite some redundancy, we are treating challenges and solutions in separate sections because there is not a one-to-one relationship between them. Some problems would need multiple design solutions, and some solutions would solve numerous problems.

Data and Analytics Challenges

The foundation of a financial regtech system would lie in the ability to access and analyze large and expanding volumes of data. Designing these processes will raise many questions.

Data Collection and Access

Data access issues will fall into two broad categories -- use of data that is generated by regulated firms, and use of external big data to supplement these internal sources.

Data from regulated firms

Regarding data from inside the system, accessing it in digital form will take a great deal of work. Information on which regulators currently require reporting already exists and is generally in "structured" formats, but it typically sits in analog form. Many companies lack the ready capacity to digitize it and to report it to their regulators via APIs.

In addition, a regtech system would need to access internal company information that is not currently reported on a routine basis. For banks, most of this information would normally be available to examiners during onsite examinations, but they would need to find or request it. It could reside in numerous kinds of systems and databases. To convert it to a format that enables offsite monitoring would require extensive work by both industry

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and regulators. To the extent that this information is currently unstructured rather than structured, it would be much more difficult to ingest seamlessly and analyze reliably.

Regulators' expanded access to firms' digitized information would of course have to be restricted under new standards to assure only authorized and secure use. Conceptual solutions for this are discussed in Exploration 4.

Data decentralization

In a digital regtech system, some traditional concepts of data collection and regulatory "reporting" would become relics of the analog age assumption that information is difficult and expensive to gather and analyze and that, therefore, regulators must rely instead on information subsets.

As regulators gain digital access to more data, in real time, the need for the industry to produce regulatory reports will abate. As discussed throughout this paper, most of these regulatory reports reflect point-in-time snapshots of a reality that existed in the past but may be gone by the time a regulator looks at it. Traditional reports also generally show partial and summarized information that can prevent granular analysis and mask valuable nuance. Instead of companies compiling and submitting reports, therefore, parts of the system will likely switch to continuous electronic monitoring or to making data "callable" in real time for analysis.

As discussed later in this section under privacy, regtech systems will probably have to figure out how to leave financial company data in place, decentralized, rather than to collect it into a central database that would raise risks for data security and privacy.

Big data

Gathering external big data would raise different issues from those arising around accessing information from regulated firms. Agencies already conduct considerable market monitoring and do research and modeling of trends, but most of this does not produce comprehensive and real-time information. Agency data scientists will face challenges in building regtech monitoring programs that can optimize the explosion of big data becoming available to them about markets overall and about individual firms.

One challenge would arise from the very different nature of Big Data. Financial regulators are accustomed to working with relatively narrow sets of information that are expected to be accurate. This information comes mainly from the regulated company and sometimes from the company's use of external sources like credit reports or data feeds relating to Know Your Customer requirements. It may contain errors and sometimes biases, but in general, people are actively working to make it accurate.

Most Big Data, in contrast, is not generated for purposes that require it to be highly accurate. Furthermore, it is usually "unstructured." Putting it to good use would require considerable work.

Regulators in many countries are already making these efforts, particularly to oversee securities markets.

Data Standards and Interoperability

Related to the data access challenge would be the need for data standards. A digitally-native regulatory system would have to be built on a foundation of common digitized data and technology standards that make information interoperable.

Information developed by financial companies would need to be converted into "digital objects" that could be readily reported to and accessed by regulators, using technology and data standards that remove the delays and loss of information endemic to today's system. Most information would need to be communicated via APIs (application program interface), rather than through traditional reports.

> **Much of the success of the software industry has been driven by objectifying and standardizing information formats. This process encapsulates functionality that is reusable, and therefore, does not have to be repeated from scratch.**

Regulatory information could be handled in the same way, built around standardized chunks that are readily available for all the needed uses.

Standard setting is difficult. To paraphrase Albert Einstein, standards should be made as simple as possible, but not simpler.[33] If they are too complex, it can take years to develop them -- some projects produce standards that are already obsolete when they are issued. Even well-designed standards, furthermore, can become obsolete later if they are too prescriptive. They may initially facilitate innovation but later impede it. Standards are also sometimes used by incumbent players to create complexity and implementation problems intended to act as barriers to entry for new competitors. People also err in trying to find a single standard that is a "holy grail," and/or become wedded to standards and then reluctant to let them go.

On the other hand, if standards are too general, they do not create a sufficiently strong foundation on which to build.

In the US and globally, many standards already exist that impact regulatory information, and there are also many standards-setting bodies. A solution for financial regulation probably would have to be designed to make a variety of standards systems interoperable with each other.

A key question concerns who should set and maintain standards -- whether this should be done by government, the private sector or a public/private partnership.

Cloud Computing

A digitally-native regtech system would require that both regulators and industry operate primarily in cloud-computing environments. As discussed in the next section, the cloud makes it practical and affordable to gather and use vast amounts of data, easily. If properly designed, it can also improve security.

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[33] https://quoteinvestigator.com/2011/05/13/einstein-simple/

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However, the security issues would present important challenges for policymakers. These include how to transition to the cloud; standards that would need to be met for regulatory cloud environments; and worry around concentrating system-wide dependence on a small number of cloud providers, in the event of cyber-attack or failure of one or more of them.

Analytics and Artificial Intelligence

As discussed in Exploration 1, all of the potential benefits of a digitally-native system are fueled by the explosion of data, in finance and everything else. The volume of information will continue to expand, regardless of how the financial regulatory system responds.

These huge flows of data cannot be processed effectively by human beings using analog-era methods. As discussed further in Exploration 4 regarding the attributes of a new system, the only way to process and interpret all this information would be through use of artificial intelligence tools like machine learning and natural language processing.

Using AI would create numerous and complex challenges for regulators. What kinds of data should be used by oversight agencies? What kinds should be allowed to be used by industry? How much data is needed to enable AI analysis to be reliable and meaningful? How can regulators prevent reliance on AI "training data" that has absorbed human misjudgments and biases? What should be done if AI analytics develop biases that, even if based on objective observation, are antithetical to legal requirements, ethical standards or outcomes sought by public policy goals and standards?

> **In 2016, Microsoft's AI chatbot Tay had to be shut down after interacting with Twitter users for less than 24 hours and learning to be a "racist jerk."[34]**

For example, AI systems could be used to flag potential credit discrimination or unfair practices. The legal criteria in these two areas are largely subjective. Over the years, both have evolved with considerable informal consensus about what practices are, and are not, considered acceptable. However, the advent of "alternative data" and machine learning has recently sparked new discussion. Fintech lenders have begun arguing that these new techniques can enable underwriting that is simultaneously more accurate and more inclusive, especially for "credit invisible" borrowers who have "thin" or no credit files or complex credit histories. Congress, regulators, lenders and NGOs[35] are undertaking research and dialogue on these claims. Regulators will have to determine what kinds of data and analytic factors can be used, and those outcomes will then have to be developed into new regtech standards as risk managers and regulators monitor emerging compliance strategies.

Finally, how would regulatory systems deal with the so-called "black box," or "explainability" challenge in AI that uses machine learning. The nature of ML systems is that they "learn" -- in effect, they "think" -- based on analysis

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[34] https://www.google.com/url?q=https://www.theglobeandmail.com/technology/tech-news/how-microsofts-friendly-robot-turned-into-a-racist-jerk-in-less-than-24-hours/article29379054/&sa=D&ust=1594404427198000&usg=AFQjCNGZrppcsePtSMte7JRQOS3hc1DQFA

[35] One such experiment in the US has been conducted by FinRegLab, a nonprofit research organization founded in 2018 to do empirical examination of these kinds of issues. Note that I chair the board of directors of FinRegLab.

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of huge amounts of information that no human could process. This enables AI, for example, to assist radiologists in reading a cancer image, based on comparisons to many more additional images than a doctor could review. At some point in this process, the machine, mimicking the structure of human thinking, can make connections between information that enable it to "understand" things humans alone could not have learned on their own. The humans must decide when to rely on such analysis, and when not to.

AI systems often present an inverse relationship between explainability and predictiveness. To gain the full benefit of these powerful tools, policymakers would have to establish standards on what makes an AI solution reliable, and fair. The resulting algorithms would have to be testable and auditable -- often by using multiple AI tools that are optimized for different outcomes and that could therefore check each other. At some point, the system may be able to move beyond testing of process and be evaluated instead based on how well it produces superior results, regardless of whether we know how it does so.

Platform Challenges
Exploration 4 will discuss the need to convert regulatory information and processes from rigid, unconnected IT systems onto "platforms." Doing so will present numerous challenges.

Interoperability and Flexibility
A digitally-native regtech system would have to shift regulatory and compliance work from vertical technology stacks to horizontal platforms that enable interoperable and modular solutions. Building on the new data and technology standards described above, regulators would create and/or approve these platformed solutions.

Many difficulties would arise in this process. Platform design would require creation of interoperable standards, as discussed above. In addition, platforms would need to be designed to be able to accept newer, better technology as it becomes available. In many cases, these superior solutions would be coming from young and small companies, since these innovators are often at the leading edge in inventing them. However, small, young companies present risks to financial companies that want to rely on their technology, both because the technology may not be mature and because new companies, of any kind, tend to have relatively high failure rates. Regulators would have to create third-party risk standards and protocols that could enable established companies to leverage these solutions on a platform, while still managing risk that companies, or their technologies, could fail.

> **Platforms would need to be designed to be able to accept newer, better technology as it becomes available. In many cases, these superior solutions would be coming from young and small companies, since these innovators are often at the leading edge in inventing them.**

These platforms would need to be integrated with proprietary ones used by the regulators themselves for their unique work. For example, the OCC has a suptech project to create a Single Supervisory Platform for its own examiners, who currently work on different platforms for large banks versus small ones. The new approach will be accompanied by a new system for Supervision System and Analytical Support (SSAS, pronounced "SAS"), which will function as a "single source of truth" on a common enterprise-wide data analytics platform. This kind of information integration is needed across the regulatory system.

Legacy Systems and "Vendor Capture"

One aspect of the platform issue is that the traditional rigid model inadvertently fosters domination by a small group of technology vendors -- a scenario sometimes called "vendor capture." This, in turn, locks in even more rigidity. Almost by their nature, these twentieth century-style business models lead to slow and periodic innovation, rather than continuous and fluid forms. Updates and upgrades are sometimes issued at intervals of several years. They generally require extensive work on IT systems, which often involves many months of work. Update projects often require expensive fees paid to the vendor, in addition to the company's own conversion costs. And as soon as such an update is installed, in today's fast-changing world, it is immediately becoming dated and eventually may be obsolete.

In addition, some vendors today own or control the data of the financial companies they serve, and charge these customers for access to it. With data being the lifeblood of innovation, this design throttles innovative change.

Dominant vendors, once entrenched, have limited incentive to modernize their own systems and may feel motivated to block out access by competitors. Many such companies experience the challenge identified by late Harvard professor Clayton Christensen as "The Innovator's Dilemma."[36] His argument was that, perhaps ironically, the most successful companies tend to be the least able to adopt technologies that are superior but would be disruptive, simply because they have too much vested interest in preserving the status quo (as well as, often, having blind spots). Sector-changing technologies typically come, instead, from initiatives by smaller, newer innovators that are starting from scratch.

Harvard Professor, Clayton Christensen

As digital regulation moves forward, the current large vendors in the space will adapt to new standards of interoperability, continuous improvement, and openness, just as newer or smaller companies will operate effectively alongside the veteran providers. The one-size-fits-all model will likely become obsolete, as will centralized systems that are closed "walled gardens."

This shift will raise numerous design challenges for development of regtech.

Legal and Ethical Challenges

Ethical Challenges

Adoption of new technology would raise numerous ethical challenges, many of which will arise before clear legal precepts have emerged to guide decision making.

Many of these challenges will involve privacy, as discussed below. Another realm of ethical challenge will arise around how AI may be used both in regulatory activities and by regulated financial companies.

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[36] https://www.amazon.com/Innovators-Dilemma-Revolutionary-Change-Business/dp/0062060244

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Privacy and Cybersecurity Challenges

New technology is clearly generating problems with privacy and information security. At the same time, however, it may also provide some of the solutions.

Conversion to a regtech system would make much more information about financial companies and their customers readily accessible to government, and also to risk professionals in their own organizations. This would inevitably raise the potential for information to be misused and to be stolen or inappropriately shared. These risks would be rising in an environment of rapid policy change regarding how data can be used and must be protected, especially for consumers. Europe has adopted sweeping privacy laws, as has the state of California, with other states following. At the federal level, the next few years will almost certainly feature turbulent privacy policy debates, long periods of high uncertainty and then probably new laws and rules which may unfold gradually over multiple years.

As a result, regtech systems would need to be designed to evolve with these emerging requirements and in some cases should anticipate them, especially by embracing ethical standards on protection of data privacy where appropriate.

To protect data from unauthorized use, the system might have to be designed with tiers of access. On one level, some information might always be visible to regulators because it is essential -- and possibly, in some cases, because it is useful to their risk analyses and is not

> " This software is the most permissioned thing I've ever built, or ever seen.
>
> — CTO of an AML software company

sensitive. A second level might make certain types of information always "callable" by regulators, under rules to assure that appropriate usage authorizations are in place. Regulators would then receive this data immediately in digital form -- again, with complete scope, and in real time. Other data might be off limits unless the regulators went through due process steps based on the agency having a good reason to ask for it.

Designers would have to make decisions about who at a regulatory agency is permitted to access what data, and why, and with what protocols for receiving permission. They would need to restrict how information could be used and how long access should remain available. Controls would have to prevent conversion of the data into non-authorized forms or databases. All access and usage would have to be transparent and auditable, and unauthorized access would have to sound an immediate alarm.

Regulated firms would be leery of a system in which their regulators could simply see everything they are doing, on demand, armed with powerful AI analytics that could detect problems the company may not even know that it has. It would be important to prevent regulators from undertaking inappropriate "fishing expeditions."

As discussed earlier, the system should also probably avoid actual "collection" of many kinds of data by regulators, in order to avoid building large centralized databases that attract hackers. Instead, information might have to remain in place in the regulated firm, accessible remotely through APIs. This approach would obviate part of the problem of how long data could be retained by the government reviewers. Conversion to cloud computing would make shifts like this feasible and could enhance security overall if properly designed.

> **The system should also probably avoid actual "collection" of many kinds of data by regulators, in order to avoid building large centralized databases that attract hackers. Instead, information might have to remain in place in the regulated firm, accessible remotely through APIs.**

Ready and robust sharing of data would also require development of better methods for protecting information through privacy-enhancing technologies (PETs), such as homomorphic encryption and zero-knowledge proof, as discussed in Exploration 4.

Finally, there may be a case for letting regulators see certain information that has been detached from its source, in order to facilitate analysis of systemwide patterns and risks. Regulators might employ "differential privacy" technologies for this purpose, to mask the identity of the individual companies whose data is being used and to prevent reverse engineering the information to unmask them. If trustable, this could ease industry cooperation in data-sharing and thereby enhance regulators' ability to monitor and detect systemic trends at an early stage.

Other Legal Challenges

Financial regulation, at its essence, is a legal construct -- a complex one. Innumerable laws, regulations, court rulings and legal interpretations constrain the ability of both financial companies and their regulators to adopt new technology. Many of these will surface as promising new technology solutions emerge, only to collide with requirements that were written for an earlier era. The system's designers would have to understand these constraints and fashion the technology to meet the requirements or, if doing so would undermine effectiveness, to signal the need for legal review.

Policymakers would also need to consider whether expanding the information available in real time to regulatory bodies could tend to shift liability for problems from the regulated entity to its regulators. This issue would have to be factored into the design of regtech systems, assuring that companies remain responsible for their compliance performance, regardless of what regulators do or do not know about their activities.

Cost Challenges

A primary argument for adoption of regtech is its potential to reduce costs to industry and government alike, without loss of regulatory effectiveness (and in some areas, with outcomes being improved).

Design of regtech systems would have to be designed to strive to overcome the following likely difficulties.

Adoptability/Industry capacity

Digitally-native regtech could be a boon to the competitiveness of both community banks and startups by driving down cost and burden and helping to level the

Most community banks lack readiness to adopt these techniques.

playing field in relation to large companies. However, most community banks lack readiness to adopt these techniques. The industry is served by a small number of core processing vendors that have met its traditional needs but that provide central IT systems that limit modularity, innovation and ready access to data. Regtech design would have to take into consideration the practical technological and legal difficulties facing smaller banks

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and credit unions in adopting regtech. These issues will also be discussed in Exploration 5, which explores practical strategies for change.

Transition costs

A related challenge is the cost of transitioning to a new system. While a full regtech-based framework could save money, investment would have to be made to build it. Designing the system should include consideration of these transition costs, for both agencies and for regulated firms. Regulators would need to quantify projected expense and secure sources of funding.[37] They would also need to consider how to create incentives for industry to convert to regtech and support agency regtech efforts. In some areas, this would involve reducing traditional regulatory oversight for companies that could demonstrate high compliance and low risk through data. The system's design should account for these challenges.

Risk proportionality

Another design consideration relating to cost is the concept of risk proportionality. A regtech system could make regulators increasingly successful in identifying risks and risk trends, and at detecting patterns of small-scale noncompliance and risk. This could open the door to adjusting regulatory requirements to deck compliance resources against significant risks, and potentially reducing regulatory burdens relating to risks that are insubstantial. An example is whether the AML Know Your Customer rules could be simplified or eliminated for very small accounts, as long as the system was equipped to prevent such accounts camouflaging a large entity's transaction activity.

Exploration 3: Challenges in Designing a Regtech System
Questions for Commenters:

Please note: This RFC is particularly aimed at gathering input on this section and especially on standards.

• What should be the scope of financial regulatory standards? What is most needed? What existing standards are relevant and what are their scopes and strengths and weaknesses?

• What are the main gaps or failures of existing standards with regard to efforts to build an interoperable system?

• What are the best places to start in creating regulatory standards? What kind of body should create and maintain the standards -- public, private, or hybrid?

• What are the key design challenges in addressing privacy and security issues?

• What are the key obstacles to and risks of conversion to cloud computing, for both regulators and industry?

• What should the roadmap be to build out this system over time?

• Do you know of research and data to amplify this outline of potential benefits, or that may counter it?

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[37] On January 7, 2020 the UK Financial Conduct Authority issued a feasibility report on use of Digital Regulatory Reporting, DRR, as part of its exploration of machine-readable and machine-executable regulation. This analysis may serve as a model for similar evaluation of benefits and costs.

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Exploration 4

PRINCIPLES AND ATTRIBUTES OF A REGTECH SYSTEM

Digitally-native regtech is young technology. It can be thought of as green shoots that are taking root in, or sometimes beside, a mature regulatory forest. It is too early to know exactly what the desired outcome should look like as regtech grows.

However, it is not too early to begin to envision it and to cultivate the young growth underway with an eye toward shaping it to maximize benefits and minimize problems. To the contrary, that visioning work is urgent, because the financial system is entering into a stage of exponentially accelerating change that will move too fast for regulators to address well if they wait.

This section looks at core ideas on how to design a digitally-native system -- the attributes it should have and the principles that should guide its development, in order to achieve its potential benefits and to address the design challenges outlined in Exploration 3.

Note that this Exploration is focused on actual design -- the *substance* of a new system. Exploration 5 will then offer practical strategies for *implementing* a regtech conversion.

Principles for Designing a Regtech System

To capture the benefits described in Exploration 2 while addressing the challenges identified in Exploration 3, a regtech system should be grounded in the following principles (some of which overlap with each other and also with the system "attributes" described just below them).

Legal Soundness and Viability

A regtech system would need to be built on a solid legal framework that respects the rights and responsibilities of all parties and that fosters innovation that can advance the mandates of the regulatory agencies. Regulators should be proactive in shaping the legal evolution of the space, given their unique combination of mission, powers and knowledge.

The system would also have to assure that regulators' expanded access to industry information does not result in the government becoming responsible if regulated firms violate the law or fail.

Ethical Soundness

Technology change in both finance and final regulation raises profound ethical questions, some of which were outlined in Exploration 3. The pace of change is likely to outstrip existing legal frameworks, opening up periods of time when there are not clear legal answers on how to address emerging problems. This means that regulators would have to apply their judgment, where they have the legal authority to do so, to align their actions with appropriate ethical principles in areas such as protecting consumers, protecting privacy, preventing bias and avoiding actions that could crush desirable innovation. At the same time, regulators would have to be careful not to exceed their legal authority in these "gray areas."

Industry Capacity

Design should address the industry's capacity to adopt regtech-based requirements, recognizing the limited technology resources of some incumbents, such as community banks, and the limited regulatory expertise of others, such as fintech startups. (As discussed in Exploration 5, regulators may also need to undertake proactive strategies to build these private sector capacities.)

Security and Privacy

The shift to digitized regulation would raise tremendous opportunities and also many risks regarding data security and appropriate regulator access and use. Regulators would have to accelerate development of standards and policies to address security and how best to control access of their own people to vastly more data than in the past. They would have to design technology that could easily adjust to evolving privacy standards in the years ahead. They would also have to address risk of concentration of risk relating to use of today's limited number of cloud platforms.

Agility and Capacity for Continuous Improvement

> **The regtech system would have to enable continuous, fluid improvement through technology, as opposed to relying on periodic updates that are expensive and that enable problems to accumulate in the intervals between change.**

The system would have to be agile, able to keep pace with industry and technology innovation.

Risk Proportionality

Adoption of regtech would have to be rooted in the core regulatory mission of risk management. Rules and processes should be rethought to deck resources against major risks to the financial system and to its customers and the public, in a landscape that will be rapidly shifting.

Experimentation

Experimentation and testing should be core elements of a digitally-native regtech system. Design work should be grounded in developing testable approaches that foster rapid learning. This would call for safe experimentation spaces like "sandboxes," "greenhouses," "accelerators" or "labs," where new approaches could be tried and failures, if any, could be contained to prevent harm. Results would have to be measured, with empirical data driving policy.

In addition, regulators would have to encourage adoption of regtech experiments and test beds by the industry, under standards for assuring that these would not create significant risk to the system or to customers. Rapid innovation is not possible without space for trial and error.

Outcomes Focus and Measurement (where appropriate)

In some areas, a regtech system should strive to establish outcomes- or performance-based regulation enabled

by the new ability to measure these through digitized data. This would require development of quantitative standards regarding what constitutes acceptable performance.

Cost Justification and Additive Impact

Regtech changes would need to be able to deliver improved results on a scale that justifies the cost of adopting them. Once well-designed regtech systems are in place, they could drive down regulatory and compliance operating costs. However, conversion expenses in some areas would be substantial. They should be incurred only if they will add substantial value.

Regtech systems should also be designed to complement and leverage the strengths of the current system, especially the expertise and judgment of seasoned regulatory, compliance and supervisory personnel.

Attributes

A regtech system that meets the above standards should be designed to incorporate the following attributes or elements. Most of these relate to the need to build regulatory capacity to move *more quickly*. The system should be designed to be:

Digitally-Native

A regtech system would be digitally-native. This means it would be built from scratch using new digital technologies, as opposed to employing automation and robotic techniques to improve processes that continue to function on old technology platforms.

Converting the system to this form would occur gradually. In many cases, new technology would be introduced fresh, sitting on the side of current systems, under plans to convert to it over time. An analogy would be a highway bridge project in which the old bridge is maintained while a new, stronger one is built beside it, except that in a regtech conversion, both bridges would be kept open for a period of time, enabling gradual transition.

> **An analogy would be a highway bridge project in which the old bridge is maintained while a new, stronger one is built beside it, except that in a regtech conversion, both bridges would be kept open for a period of time, enabling gradual transition.**

Data-Centered and Cloud-based

The regtech system would have data and data analytics at its center. Most regulatory activities would be designed to optimize their use. The data and technology would meet standards that assure quality and interoperability.

In a digitally-native system, both regulators and industry would work mainly in cloud computing environments. This would be necessary for two primary reasons.

First, cloud computing, despite some vulnerabilities, can generally produce better overall security than do the on-premises systems used widely in financial services. The latter often involve aging, stitched-together IT inherited and patched over years or decades of mergers and acquisitions. Moving most of the system into the cloud

> "
> We have realized that the price of not being in the cloud is not being able to innovate.
>
> - Regulator interviewed for this paper

would require policymakers to address numerous challenges, including the relatively small number of cloud services providers creating the potential for a centralized, catastrophic attack. Still, these systems can also be defended with technology that keeps up with the increasingly sophisticated tools used by criminals, and can be readily designed to assure redundancy and backup.

Second, a cloud environment is a massive cost-saver. Instead of having to invest in capital-intensive IT systems, financial providers and regulators in the cloud can simply pay for the computing power they use, even at very small levels. This is one of the keys to enabling community banks to be competitive going forward.

Among other things, this ability to scale use of computing power enables far more innovation, by making it affordable to try things out without having to overhaul IT systems on a large scale.

AI-Enabled[38]

A digitally-native system would analyze vast volumes of data using machines to leverage the time and skills of human beings. Data availability and AI have a symbiotic relationship. The more that useful data becomes available, the more AI systems will learn and make themselves valuable. The more valuable they become; the more data will be fed into them.

A central challenge of regtech would be to apply sophisticated artificial intelligence (AI) technologies like machine learning (ML) and natural language processing (NLP) to regulatory and risk management work. These techniques would be used to analyze and find patterns in large volumes of data. They would detect issues that humans would either invest large amounts of time in finding, or would miss. They could enable human experts to prioritize and more sharply target their work.

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[38]Robotics would be used in regtech, especially early on, to automate routine processes like information gathering. This can save time for humans and free up resources for advanced work. It is worth noting, however, that reliance on robotics is likely to decline over time, since robotic technology is not "smart" and therefore cannot help with the high-end analytical challenges at the heart of a new regulatory system. Robots are mainly used to speed up or ease old processes that will, themselves, go away as new digital technologies remake core regulatory functions.

> **(The Bank of England will explore)** "...how new general purpose technologies, like the Cloud and AI, can be used to strengthen the resilience of the system. Embracing these technologies could herald leaner, faster and more tailored financial services. Banking is already the second biggest global spender on AI systems (after retail) and the sector is expected to invest a further $6 billion on AI this year." [39]
>
> **- Former Bank of England Governor Mark Carney**

For example, regulators are already using machines to detect anomalies in the behavior of securities traders that could indicate insider activity and market misconduct. They are using machines to "police the perimeter" of the financial system by crawling over social media and flagging unauthorized offers of services that require a license. Using regtech, regulators could detect possible indicators of discrimination and unfair, deceptive, or abusive acts or practices (UDAAP). They could find patterns of financial crime that reveal not only the easy-to-catch criminals, but also the global networks that launder hundreds of billions of dollars each year. They could flag signs of rising loan non-performance, especially in newer credit products, detecting system-wide indicators that need close monitoring (such a process might, for instance, have prevented or mitigated the subprime mortgage meltdown and resulting financial crisis).

Such systems would not be used on their own to prove illegal or risky behavior, but rather would equip human experts with vastly better intelligence about these situations.

As noted earlier, these shifts may eventually enable adoption of outcomes-based regulation in some of these subjective realms, which could expand financial access, reduce lenders' regulatory risk, and reduce regulatory and compliance costs system-wide.

API-Enabled

Regtech-based information flows would move into formats that operate through Application Program Interfaces (APIs), enabling companies to share information with regulators in real time and complete form. Regulators and industry could eliminate most or all current reporting systems that are periodic and therefore lag the present time. They could also eliminate most reliance on file sampling as a way to identify potential risks that may need more scrutiny. Companies would no longer need to compile complex special reports.

Creating API-based communication is well underway at regulators in the US and around the world.

Open Source (where appropriate)

One critical element of regtech design may be less intuitive than the others. To make the revised system interoperable and efficient, the regulatory world would migrate to partial adoption of "open source" computer code.

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[39] https://www.bankofengland.co.uk/-/media/boe/files/speech/2019/enable-empower-ensure-a-new-finance-for-the-new-economy-speech-by-mark-carney.pdf?la=en&hash=DC151B5E6286F304F0109ABB19B4D1C31DC39CD5

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For many people in finance and financial regulation, this practice sounds high-risk -- the term "open" suggests insecurity. However, open source practice underpins the technology world's ability to move quickly and is used in many functions requiring high levels of security. It is almost universally embraced for any situation where proprietary code is not needed. This is one reason that fintechs can compete nimbly with bigger companies. They do not write all their code themselves. They get basic tools from a well-vetted code repository like GitHub.

Open source offers major advantages. The code involved is date-stamped when created or changed, documenting when something was added and by whom. A clear chain records how a given set of code has been built and/or improved upon over time.

The process also engenders crowd-sourced vetting. With open source tools, large numbers of people have evaluated and used the code and have provided feedback and fixes to make it better. Errors and security flaws cannot easily be missed or concealed, with many sharp eyes watching.

Tech world practice was not always this way. In the 1990s, many technology companies had vested interests in proprietary systems that functioned like walled gardens, designed to lock competitors out and lock customers in. Over time, the industry concluded that the whole sector, and each company, does better when some technology systems are interoperable and when innovators can build on each

> **"**
> If we're looking at a vendor product, we like to see that it is using open code, because at least we know what that is. It's much less dangerous than the code the company's engineers have written themselves, which may or may not have problems.
>
> - Bank Risk Manager

other's work. The benefits are so strong that companies like Google and Microsoft continue to release large swaths of formerly proprietary code for open source use.

Financial regulators can reap many benefits from these systems. For one thing, they can avoid reinventing each other's wheels. If one agency writes software to, say, crawl over online media to look for false advertising (as one has), it would be desirable for others to be able to consider adopting and building on it, rather than starting over. If one regulator has built a chatbot to receive and prioritize consumer complaints (as one has), it would help for others to be able to adapt it to their own needs.

A good step could be to create the regulator version of GitHub, or sections in GitHub, where agencies and industry can readily share tools.[40]

Even more importantly, open code will be needed to form the foundational protocol layer that enables technology systems to talk with each other and to transfer information with full interoperability. If this is not established, the regulatory system will not be able to keep pace with the exponential change ahead.

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[40] AIR has begun to do this in partnership with the nonprofit open source organization FINOS.

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> **Open code will be needed to form the foundational protocol layer that enables technology systems to talk with each other and to transfer information with full interoperability. If this is not established, the regulatory system will not be able to keep pace with the exponential change ahead.**

As noted in the introduction, building a digitally-native regulatory system is not as complicated as the challenge tackled by Sir Tim Berners-Lee in inventing the World Wide Web in the 1980s. His work leveraged the hypertext transfer protocol -- the open source HTTP that we see every day as a prefix on web addresses. That, in turn, led to a complete remaking of how the world works, connecting nearly every country, and every company, and nearly every individual in the world. This was all accomplished in just a few decades, and the innovation driving it continues apace.

The internet's open source code is maintained by international public/private bodies. In the twenty-five years since the original code, HTML1, was released, the system has gone through five generations. Each has dealt with flaws in the prior generation and added capacity to address the new uses needed in the market -- HTML5, for instance, can accommodate demands like streaming video and interactive internet-based applications like Google Docs. It creates the ability to constantly iterate and evolve.

This open architecture forms connective tissue, shared rails. Private and public entities then can easily build closed, proprietary tools on top of it, as happens every day on the internet.

A future paper in our Regtech Manifesto series will explore open source in more depth.

Platformed and Interoperable

As discussed in Exploration 3 on challenges, digitization should shift much of the regulatory and compliance system away from vertical technology stacks and onto a horizontal platform design in which information and tools are modular and interoperable.

This would enable huge gains in efficiency and permit the continuous innovation cycle described above. Among other benefits, this design would counter the tendency toward "vendor capture." Inflexible old IT and "walled garden" environments would be replaced by systems in

> Inflexible old IT and "walled garden" environments would be replaced by systems in which regulators set standards for quality, security and interoperability. Both regulators and industry would work with an array of providers -- old or new, large or small.

which regulators set standards for quality, security and interoperability, enabling any compliant solution to then "plug and play" with the technology in use and work seamlessly. Both regulators and industry would work with an array of these modular providers and tools -- old or new, large or small.

Vendors would be allowed into the system only after meeting high standards set by regulators (or in some cases, by public/private entities entrusted with the task) for data security, consumer protection and effectiveness. In

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today's world, many younger companies can meet a very high bar on those criteria, because they have newer, superior technology and cleaner data.

In his book *Unscaled*, venture investor Hemant Taneja explains how AI is fundamentally changing organizational models. Twentieth century technology rewarded large, centralized corporations and governments that could leverage their positioning to achieve scale. In the 21st century, that model is becoming a liability, impeding innovation and agility. It is being replaced by platforms, ranging from Amazon and Facebook to Apple's App Store, that enable many players to leverage the platform's infrastructure, to connect to networks, and to set standards.

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For example, every financial company needs tools to meet Know Your Customer requirements, or KYC. Typically, the company relies on one or a few vendors to help them perform this function. In practice, vendors have varying strengths and weaknesses in this work. Some may be more efficient for KYC review of routine customer situations, while others may specialize in high-tech analysis of complex cases or screening for sanctioned persons. In a platformed, modular environment, the company would be able, easily, to combine the benefits of both. Users could deploy multiple vendors even for a single use, in order to compare results, tap into more information and avoid the pitfalls inherent in one-size-fits-all models, which almost always have weak spots as well as strengths. In addition, the KYC solutions could be built to be compatible with other tools that address the chain of functions needed to comply with AML rules, such as the requirements for transaction monitoring.

As discussed in Exploration 3, one global bank is already partnering with a technology company to launch a regtech "app store" that builds toward this kind of platform design.

Enabling fluidity based on common standards and platform design would assure that "new blood" innovation constantly enters the system. It also could assure that all players are being continuously vetted, challenged and competed against. Regulators should avoid choosing winners and losers or endorsing particular vendors. Instead they should set clear and consistent standards that everyone must meet in an ever-changing environment.

> **Regulators should avoid the problem of choosing winners and losers or endorsing particular vendors. Instead they should set clear and consistent standards that everyone must meet in an ever-changing environment.**

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[41] https://www.amazon.com/Unscaled-Generation-Upstarts-Creating-Economy/dp/1610398122

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The financial regulatory system has never had updatable systems like this. Any activity that relies on manual work, or batch processing, or periodic reporting and similar tasks, functions today with what one veteran compliance expert has called a "rat's nest" of translation tools to move information. This problem could be eliminated in a well-designed digital system.

Standards-Based with a Common Data Language

A platformed, interoperable model will require development of uniform data standards that will create, in effect, a common language for communicating about the information in the regulatory system for regulators, firms and vendors alike.

One can envision regulatory technology standards being built in layers. One layer would be for regulators to use in issuing rules in the form of computer code (as discussed also under machine-executable regulation). Another layer might address languages -- ways to express regulations, where programming languages have themselves become standards. The bottommost, foundational layer would deal with formats for the underlying data elements -- how to organize the data, how it feeds in, and how it is used. A fourth could address protocols for areas like privacy, access, provenance and other difficult matters that arise in handling sensitive data.

A major problem in the system today is that laws and regulations issued in words often need to be interpreted before they are translated into compliance systems. This interpretation step is normally done by the regulated bank or company, which means that interpretations inevitably vary. That process, in turn, means that data collected by regulators, whether for bank safety and soundness or regarding compliance or risk, also varies in quality, accuracy, and consistency. Creation of a common bottom-layer data standard for expressing the most granular data, and then issuing regulations in machine-readable and machine-executable form, can solve this problem, in addition to solving for costs and timeliness.

AIR intends to launch a public/private initiative in 2021 tentatively called The Regulatory Design Project to lay out the path for designing these foundational standards and creating a truly common regulatory language. It will be designed as open source, so that every entity can use it, help vet it, and build upon it.

Secure and Permissioned

Conversion to regtech would require a thorough review of how regulatory information is kept secure from breaches and attacks. New methods of encryption will likely be needed, especially as regulatory data becomes more extensive and robust, and therefore valuable.

A regtech system would also require fresh thinking about what data regulators, themselves, should be able to see and to call for, under what circumstances. As discussed in Exploration 3, regulators would need to map out tiers of access and the permissioning environments around them. Some information might always be transparent to regulatory officials with proper authorization, in complete form and in real time. A second category of data might always be callable by regulators, under rules that would limit why it can be called and who can call and see it. Other information might be shifted into digital form to facilitate review, but might fall outside the "see and call" system. Agencies may explore privacy-enhancing technologies in which they can query industry data sets and receive only limited information, as with zero-knowledge proof techniques.

Conceptually, information in a regtech system is not very different from current bank regulation. Generally speaking, bank examiners can look at whatever they want to in a bank. They also already use risk-based logic to prioritize what they want to review. However, traditional tools and information systems put practical limits on what regulators actually can see and use effectively. Creating a system in which data is much more accessible and is moving more easily into the hands of regulators calls for rethinking of how these information flows should work. Permission and access would need to be controlled to address a range of potential problems, including assuring data security and protecting customer privacy.

Another concept, "differential privacy," could enable analysis of large sets of data by regulators who would not even know what specific company it came from, but would be able to use it to analyze systemic trends. Differential privacy techniques prevent reverse-engineering data in order to unmask hidden information. "Noise" -- inaccurate information -- is injected into the data in amounts too small to disturb observation of major trends. This, combined with limiting how many times a reviewer can run particular types of queries, prevents a user from being able to figure out, say, whether a given individual is present in the data set. If financial firms had confidence that data provided under these protocols could not be used in scrutinizing their individual companies, it could be possible for regulators to gain industry cooperation with wider data sharing that could greatly enhance monitoring of macro risk trends.

Policymakers must also address the question of what information regulators should be able to retain and store, after they call for data. As with privacy policy in other areas, it may be that they should have an obligation only to ask for what they need, and to limit how long they keep it.

As noted earlier, this issue also ties to the question of whether expanded regulator access to information might shift liability from the company to the regulator when problems arise. This might necessitate new legal frameworks.

Meanwhile, the whole concept of regulators "keeping" data will shift if the system adopts a decentralized approach, as discussed below.

> " Our vision is that the Bank would be able to 'pull the data on demand' from firms rather than 'sit back and wait to receive data' from them. With the right API, Web Portal or Platform, manual Interventions could become obsolete, making the process quicker, more efficient and hugely less expensive. It would free up resources for firms to focus on delivering a better service to their customers, and it could discipline us to take only the data that we need to use and have the capacity to review it.
>
> - Former Bank of England Governor, Mark Carney

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Decentralized and Encrypted (where appropriate)

The regtech principle of data security and privacy, including risks around agencies retaining information over time, would probably call for pursuing data decentralization as an attribute. Where possible, information would be available to regulators but not actually collected in a central repository. Centralized systems that gather large amounts of sensitive data become "honey pots" that attract hackers and cyber-criminals, and that also carry high risk of accidental loss of information.

Giant Oak CEO Gary Shiffman[42] has coined the term "the traveling algorithm" to describe the strategy of taking the technology to the data, rather than bringing the data to the technology in a central place.

Sharing information that remains decentralized would increase the need for data to move in forms that are encrypted or otherwise protected. A theme is emerging among regulators that some data security problems may be solvable through Privacy-Enhancing Technologies (PETs) such as "homomorphic encryption" and "zero-knowledge proof."

> Giant Oak CEO Gary Shiffman has coined the term "the traveling algorithm" to describe the strategy of taking the technology to the data, rather than bringing the data to the technology in a central place.

Homomorphic encryption is a technique that allows the users of encrypted data to work with it without decrypting it. If the information is stolen, the hacker receives nonsense that cannot be deciphered and used.

Zero-knowledge proof strategies enable parties to check or verify information with each other, without having to share full records. For example, to enable an alcohol purchase, a seller needs only to know whether the buyer is old enough to purchase the product. Sellers do not need to know the person's actual birth date, much less all the other information on a driver's license or identity card. Zero-knowledge proof techniques like this could be applied to regulatory functions such as Know Your Customer verifications, enabling players in the system to query each other and receive useful yes/no answers, without the risks involved in transmitting data.

It is too early to know whether or how these methods could work in financial regulation. Extensive work on the concept has been led by the UK Financial Conduct Authority, which held a "tech sprint" to explore it in the summer of 2019.

Machine-Readable

A modernized system would make regulations and regulatory guidance machine-readable. Rules would be tagged electronically so that algorithms can determine whether a given entity or activity is covered and, if so, what action is needed. This could save massive amounts of time and expense.

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[42]https://regulationinnovation.org/podcast/fighting-financial-crime-with-science-giant-oak-ceo-gary-shiffman/

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Both regulators and regtech firms are working on these innovations throughout the world. Agencies are developing "taxonomies" of their requirements, identifying the varying terminology they have used for key material so that machines can map it to standardized interpretation. The AI technique called Natural Language Processing, NLP, can also be harnessed for this kind of analysis.

> " Digitizing the rulebook for machine-readability should be the top priority of every regulator.
>
> – Former CFTC Chairman, Christopher Giancarlo

Former CFTC Chairman Christopher Giancarlo has said that "digitizing the rulebook" for machine-readability should be the top priority of every regulator.[43]

Machine-Executable (where appropriate)

A new system should enable some regulations to be issued in the form of computer code to make them machine-executable -- in effect, self-implementing. This is especially promising, initially, for regulatory reporting.

Regulators interested in this approach can build on the work of the UK FCA and the Bank of England, which experimented with this approach in a 2017 "moonshot" tech sprint and have since cultivated a major project on Digital Regulatory Reporting, or DRR. This issue is one of the most ambitious in the regtech world and will be discussed further in Exploration 5.

Blockchain Enabled (where appropriate)

Regtech systems would leverage the emergence of blockchains and Distributed Ledger Technology (DLT) for activities that need clear and transparent views into how information, transactions or records have flowed. These solutions are generally at an early stage today, but hold great promise. For instance, some Know Your Customer regtech leverages blockchains to track validated customer identities. Companies may be able to demonstrate their compliance by channeling their records into a permissioned distributed ledger that regulators can see.

In addition, the emergence of blockchain-based payments systems in the form of cryptocurrency will have enormous regulatory implications. While transactions on these systems are partially masked regarding the identity of the parties, these ledgers capture a complete record of how funds have moved through the system. That can form the basis for potential breakthroughs in combating financial crime.[44]

Government Office for Science

Distributed Ledger Technology: beyond block chain

A report by the UK Government Chief Scientific Adviser

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[43] https://regulationinnovation.org/podcast/from-analog-to-digital-regulation-cftc-acting-chairman-christopher-giancarlo/
[44] In 2020, AIR will hold a financial crime TechSprint on techniques for curtailing the use of cryptocurrency to purchase online Child Sexual Abuse Material (CSAM). This kind of technique has promise for regtech.

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Agile

Conversion to regtech will almost certainly involve the regulatory sector adopting, and encouraging the industry to embrace, the concept of "agile" workflow that is ubiquitous in the technology world. Agile methodology involves breaking complex projects into smaller ones and bringing together multi-disciplinary teams to do rapid building of solutions. It contrasts with the traditional "waterfall" processes that dominate finance and regulation, in which initiatives travel through a linear process and sequential reviews. Agile work is necessary to successful rapid innovation.

Design-Centered

A digitally-native regtech system would incorporate the tech world's concepts of "design thinking" and "human-centered design." These processes put the user of any product or process at the heart of every single design choice that is made in creating it. Human-centered design drives the wonderful user experience (UX) that we notice in many tech products as consumers (and that we sometimes notice for its absence in others).

> **One person interviewed for this paper described being trained several years ago on a compliance software tool that is widely used today in the industry and by regulators. He said that throughout the three-day education session, the trainer repeatedly said, "I know this doesn't make sense, but this is how you have to do it." The software was analog-era in its roots, and its maker typically updates it every few years. In that interval, user difficulties accumulate. Our interviewee noted that he later moved on to lead the compliance team of a digitally-native fintech company. Regarding his new firm, he said, "If someone told us that our users had to do things that 'don't make sense' to accommodate our software, our engineers would fix it that day."**

In a digitally-native regtech system, regulators would put designers on their staffs. They would encourage the evolution of design-centered solutions in the regtech marketplace. Making this shift would equip both regulators and risk managers with far more powerful tools for finding and solving potential problems than they have ever had before. It would also help attract younger and more tech-oriented people into the financial regulatory workplace -- including some who want to work in the wide open space of financial regulation which, as noted earlier, is virtually untouched by design thinking.

Multi-Agency

While individual regulatory bodies can undertake useful work in building regtech, a successful system would have the attribute of multi-agency sponsorship and coordination, at least for creating the standards and protocols needed for interoperability.

Multi-agency efforts are more complex than single agency initiatives. Regulators would need to find connections that can be formed easily and to build these out over time.

Exploration 4: Principles and Attributes of a Regtech System
Questions for Commenters:

Please note: We think Explorations 3 and 4 of the paper need the most development. We will welcome all comments, and are especially interested in these questions:

- Are these principles and attributes clear? Are they valid and important to regtech design? Are some principles and attributes missing?

- Are the technology concepts covered described correctly? Can we improve how we explain them?

- Do you have ideas on how to realize these concepts in a regulatory environment? For example, how can a regulatory system be converted to genuinely digitally-native design, while it is still operating in its traditional form?

Exploration 5

PRACTICAL STRATEGIES FOR
CONVERTING TO DIGITALLY-NATIVE REGULATION

Suppose we could design the financial regulatory system starting today, from scratch, using today's digital technology? Surely few people would build what we have now.

It is easy to imagine a better approach. It is, however, difficult to achieve it, given where we are. The question becomes, how could we get there, from here?

Regulatory officials do not have the option to start fully from scratch, but the "from scratch" mindset is the key to regulatory modernization.

Former Intel CEO Andy Grove told a story in his 1996 book, *Only the Paranoid Survive*, about how Intel pivoted from its dominant but rapidly eroding position in the memory-chip business, which had become commodified. Sitting in his office with Intel cofounder Gordon Moore (of Moore's Law fame), Grove asked: "If we got kicked out and the board brought in a new CEO, what would he do?" Moore said a new CEO would get Intel out of memory-chips. Grove said, "Why shouldn't you and I walk out the door, come back and do it ourselves?" That is precisely what they did -- with legendary success. Regulatory officials do not have the option to start fully from scratch, but the "from scratch" mindset is the key to regulatory modernization.

Again, the technology already exists to transform financial regulation into a high-performing and lower cost system. It is already mature and tested and vetted, in use every day in countless organizations throughout the world, and is always undergoing continuous improvement. While many challenges would arise in adapting these innovations to the regulatory realm, the difficulties would not be primarily technological. They would be cultural, organizational, financial, political and practical.

The technology already exists to transform financial regulation into a high-performing and lower cost system. It is already mature and tested and vetted, in use every day in countless organizations throughout the world, and is always undergoing continuous improvement.

These obstacles are so severe that many people have assumed a real overhaul is impossible, that regulatory systems will become stalled in a permanent state of suboptimization as technology outpaces their capacity to respond. However, that assumption is cracking under the weight of the forces laid out in Exploration 1 on the need for change. Regulators and private innovators in the US and throughout the world are taking increasingly bold steps, sometimes in ways that require both vision and courage.

These leaders have begun to create practical architectures and formulae for how to remake regulatory systems, piece by piece, so as to yield quick wins in the short term and a transformed system over time. In many cases,

they have tapped into techniques from wellsprings of innovation like Silicon Valley, adapting them to the unique needs and risk constraints of regulatory activity.

This section offers strategies that regulators and policymakers can employ to transition to a digitally-native regtech system. It is followed by two suggested Roadmaps that distill the ideas in the Manifesto into an actionable step-by-step guide for getting started.[45]

One Roadmap lays out steps for undertaking an incremental conversion. The other suggests an action plan for regulators who want to move more rapidly.

Getting Started – General Change Management Strategies

Converting to a regtech system is an enormous project that will involve hundreds of decisions and thousands of changes. Not surprisingly, regulators often ask, how should we structure this effort?

At its essence, a regtech system conversion is an exercise in classic change management. A practical first step is to set up a strategic planning project. This is something that every financial regulatory body knows how to do. Agencies will need to marshal the tools of strategic planning and management -- assembling a planning team, engaging the right players, gathering information, articulating mission and vision, identifying needed resources, and creating plans and accountabilities for all the important building blocks of change.

For adopting regtech, several specific approaches should be emphasized or added.

Planning Team Composition and Leadership

Conversion to a digitally-native regtech system will be impossible unless it is driven by both the top leaders and the *career opinion leaders* of the agency (and of the financial industry, as well). As discussed more fully below, the conversion will require a culture shift that these people will have to model and evangelize. For bank regulators, this means the planning effort should be visibly led by the agencies' supervisory leaders.

It must also actively seek the buy-in of the agencies' field examiners. These are the people who interface most with the banks, which means they have the relationships that matter most to the banks. As discussed under talent management, modernization will fail if there is a disconnect between headquarters and field forces.

Other key groups will be IT leaders, including those working on transitioning to cloud computing, and the agency's innovation leads, who are already steeped in the technology trends underway.

Agencies would also be smart to over-represent millennials in the planning project. As noted earlier, they are the largest generation and are digitally-native. They can build the future.

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[45] Please note that a longer set of regtech recommendations is laid out in my forthcoming series of papers on Regulation Innovation being published at the Harvard Kennedy School Center for Business and Government and available in summer 2020 at www.RegulationInnovation.org.)

> **Agencies would also be smart to over-represent millennials in the planning project. As noted earlier, they are the largest generation and are digitally-native. They can build the future.**

Regulatory bodies will need to bring digital transformation to the center of their agendas, driven personally by both their presidentially-appointed leaders and their senior career officials. This will require developing a vision and plan for how to execute the conversion over a multi-year time horizon and for absorbing technology people and content into everything they do.

Technology-Infused Planning

It can help if the strategy project has a tech "look and feel" that sets it apart from traditional planning and models that this effort is innovative. One approach is to design it around use of agile workflow (discussed later in this section), in which small, diverse teams work in short bursts of effort to achieve set tasks, using frequent base checks and problem-solving. The project should also include active brainstorming with the regulated industry.

In addition, the planning team should visit technology leaders in industry -- go to their facilities and observe the many ways in which innovative companies operate differently from government. This goes deeper than having ping pong tables and beanbag chairs or wearing jeans and tee-shirts. Technology companies are set up to maximize teamwork and to create a palpable atmosphere of creativity. The regtech team could, for instance, observe a problem-solving hackathon. In its own work, the team may want to hold "solution sprints" to generate new ideas on how to solve hard problems like how to speed up regulatory processes or change culture.

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It will also help to talk with regulators in countries that have advanced regtech programs, such as Singapore, Australia, Philippines, the UK and initiatives that are underway in Africa.

The project should invite technology speakers to the agency. It should meet sometimes offsite in environments that foster out-of-box thinking.

It should also engage a planning facilitator who has technology world experience.

Positioning the Exercise -- How High to Aim?

Regulators undertaking conversion to regtech should consider where they want to position themselves on a scale and timeline of proactivity. Some will opt for incremental change, while others will set a more aggressive agenda. Factors driving this choice will include assessment of whether gradual change will suffice to meet emerging

challenges; difficulty of achieving agency-wide embrace of regtech, competing priorities; resources; and ability to identify and enlist effective change leaders.

For agencies that choose an accelerated agenda, the Roadmap that follows this section lays out an approach with two concrete recommendations.

Whether the strategy has greater or lesser urgency, agencies should adopt a stance of "tech activism," a term coined in a 2019 report issued jointly by the consulting firm Protiviti and the International Regtech Association (IRTA). Entitled, "An Urgent Call for KYC Optimization: A Global Market Study Calling for KYC Innovation and Collaboration," the report says:

> Regulators should foster a culture of tech activism rather than one that is tech-agnostic. Tech activism requires regulators to be actively technology-informed, and to develop views on specific technologies without endorsing actual vendors.

Structural Strategies

One tried-and-true method for jump-starting major change is to reorganize. The very act of breaking up existing workflows and chains of command can accelerate efforts to move away from old models and make room for new ones. On the other hand, reorganization can also set progress back before it moves things forward, as new structures take time to get into motion.

Whether through formal reorganization or informal linking, it will be important for agencies to actively connect four nodes that are often, today, isolated from each other. These are 1) the agency's innovation initiatives (which at most agencies tend to be outward-facing and to focus on how best to regulate industry fintech); 2) the suptech initiative if there is one (for bank and credit union regulators); 3) the Chief Technology Officer and IT department, especially the people working on conversion to cloud computing; and 4) the data science group and Chief Data Officer, if the agency has these. The data science focus would include any groups conducting market monitoring through AI (usually, today, at securities market regulators).

One approach would be to have these units form a task force or working group to cross-educate on their respective efforts, coordinate priorities, and assure that they are building compatible approaches that can leverage each other. This work should, in turn, report in frequently to the strategic planning team, and many people should serve on both.

There is also high value in creating interagency structures, which will be discussed below under Collaboration Strategies.

Culture Change Strategies

This section proposes concepts and strategies that can help accelerate culture change. Most of the ideas have one aim above all: helping the agencies *move faster.*

Most of the ideas have one aim above all: helping the agencies *move faster.*

We talked with numerous current and former regulators in developing the Manifesto. A consistent refrain was that the biggest challenge the agencies will face will be changing their cultures.

Management guru Peter Drucker is credited with saying, "Culture eats strategy for breakfast." The regulatory system will not be converted to a high-tech format unless regulatory bodies convert their cultures to proactive embrace of digital technology.

Regulatory Agency Culture

In some ways, today's regulatory bodies are not well-designed to address mold-breaking and fast-moving change. This is not a criticism. Our system has been set up, for good reason, to be careful and risk-averse and prudent (some financial oversight bodies are referred to as "prudential regulators"). This necessarily makes them relatively slow-moving and skeptical of rapid change, not to mention "transformation." In the

> " Regulators by their nature are hesitant to embrace change. The easiest job I could have is a job where I just say no to everything in the next few years…If I wanted to have a really easy job, I would just say, 'No' because it's safe, right?
>
> - FDIC Chairman, Jelena McWilliams

parlance of the technology world, this deliberate pace is a feature, not a bug.[46]

On the positive side, however, these venerable institutions are uniquely well-suited to lead the work ahead. They have long traditions of adopting innovation and technology. They have unparalleled expertise in financial regulation. As noted earlier regarding *The Innovator's Dilemma*, successful organizations can be victims of their own success, which makes it hard for them to embrace disruptive technologies because their current approaches generally work well. When they do commit to change, however, they can be uniquely able to harness their talent and processes to achieve profound shifts.

I recall becoming Deputy Comptroller of the Currency fairly early in my career, after working for the US Senate. I quickly began to absorb the OCC's strong culture, which is mirrored in those of all financial supervisory bodies. I internalized the solemn responsibility we carried for keeping the national banking system safe and sound. I understood the gravity of our legal and ethical responsibility to keep examination information confidential. I experienced the heightened adrenalin around closing failing banks -- the criticality of not triggering panic or a run on the distressed institution as our teams arrived, with the FDIC, after hours on a Friday and worked all weekend so that, on Monday morning, the bank opened its doors carrying a new name and new ownership, and with

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[46] https://regulationinnovation.org/podcast/jelena-mcwilliams-chairman-of-the-fdic/

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everyone's deposits still safe. I saw the pride that colleagues felt when they passed the rigorous test to become a National Bank Examiner, or NBE. I learned something of the culture that organizations develop when a high percentage of their employees live mostly on the road, operating out of their suitcases, sleeping in motels, and for many, spending most of their time in small towns. I learned to appreciate people who devote their lives to public service, even when they could have more lucrative careers in the private sector.

Decades later, the things I learned at the OCC, and my pride in having been there, still shape how I view the world and my work. My former colleagues from those days are still my friends. My son became a bank examiner.

These are very potent cultures.

My time at the OCC taught me something else: if you want a bank regulatory agency to change, don't rely on issuing policy top-down from the

> Decades later, the things I learned at the OCC, and my pride in having been there, still shapes how I view the world and my work. My former colleagues from those days are still my friends. My son became a bank examiner.

Presidentially-appointed leaders. These are essential of course, but still, everyone in the agency knows that the Presidential appointees and their teams come and then go. Rather, concentrate on winning the commitment of the senior bank supervisors, the able, expert leaders who are respected by the rank and file because they deeply understand bank risk. These people know that we are always near the edge of potential crisis and they know, most of the time, how to keep it at bay.

Perfect as Enemy of the Good

A common cultural stumbling block for efforts to modernize technology is the human tendency to compare a potential new approach to perfection. It is always easy to see problems and drawbacks with the new idea. Since nothing is perfect, however, the more appropriate standard is to compare new approaches to what we *actually have today*.

Despite the skilled and dedicated efforts of regulators and risk management professionals, the current system sometimes misses risks, imposes high costs, inadvertently limits access to affordable financial services and fails to protect consumers. It also catches less than one percent of global financial crime. This opens the possibility that new approaches could bring tremendous improvements, even while falling far short of perfection.

For example, policymakers are rightly concerned about the potential that AI "black box" algorithms will reflect or develop biases. While these risks need attention, we should also recognize that the systems we have today, including the human brains we now rely upon in discretionary decision-making, harbor biases as well.
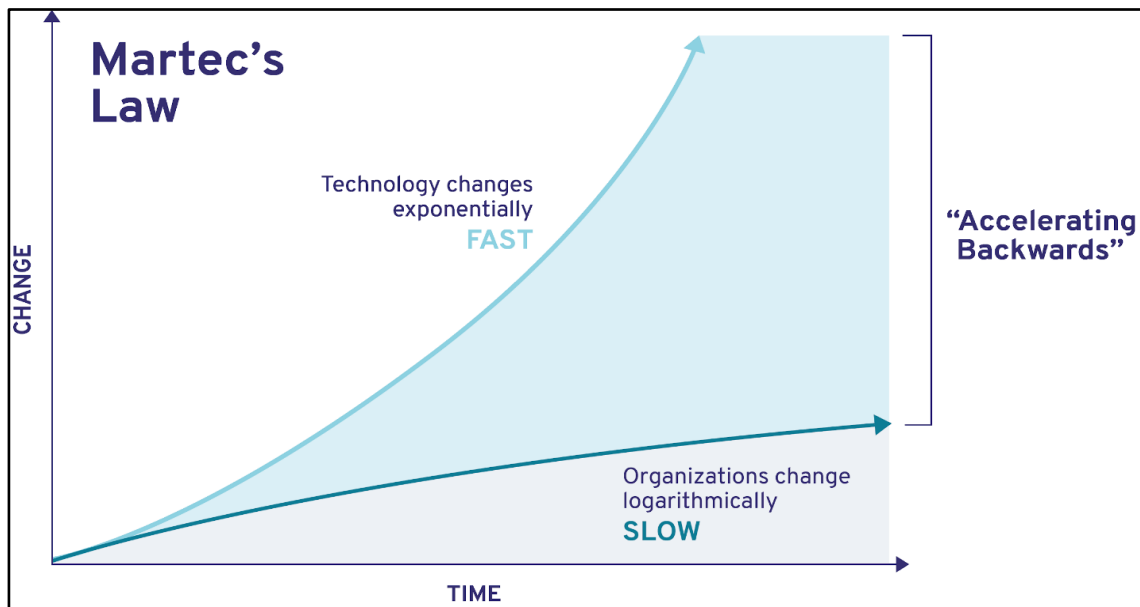
If equipping regulators and industry risk managers with more information and better tools will make financial regulation work better -- enough so to justify adoption costs -- policymakers should support it.

The Need for Speed

Speeding up regulatory processes will raise major cultural concerns.

The graphic above is another depiction of the shape of exponential change, contrasted with the linear curve that is the norm in most organizations and in financial regulation. The rapidly widening gap between the two contains rising risk. Leaders in such dynamic situations are inevitably unsure about what to do, and many default to a wait-and-see stance, thinking that the best course of action will become more clear with time. In reality, these leaders are losing ground at a faster and faster rate. Cultures will need to develop a bias for action (accompanied by new risk containment strategies, as discussed later in this section).

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[47] https://www.wired.com/story/self-driving-cars-rand-report/

Risk-Taking

Intertwined with the need to accelerate will be the need for cultural comfort with taking some risk. Clearly financial regulators cannot and should not become high risk takers. Nevertheless, modernization will require an increased cultural capacity for risk taking, because innovation, everywhere and always, requires it. There is no possibility that innovation can be optimized, in any setting, without willingness to incur some risk -- to try things that might fail and learn from the process. This truism rises to the level of existential necessity in an environment of exponentially-growing technology change.

Regulators will rightly worry that innovation undertaken unsoundly or too fast, either by the companies they oversee or by the agencies themselves, could undermine their missions and cause harm. They will also recognize the potential for reputation damage to the agencies and their leaders if things go wrong.
At the same time, regulatory officials increasingly see the risk curves crossing, as it becomes more dangerous *not* to innovate than to move ahead with carefully controlled risk-taking and accelerated action. Excessive caution today could cause failures to spike in the future.

The key to developing a Digital Age-appropriate risk culture will be to build new risk-abatement systems as discussed later in this section. These should be accompanied by proactive work on articulating and developing new cultural norms. [48]

> ❝
> (At the OCC) we need to create clarity around which technology is okay for the banks and what we think about new models of doing things. Because otherwise banks will be inappropriately conservative, whereas we want them to be optimally conservative.
>
> - Brian Brooks, Acting Comptroller of the Currency, May 2020

Collaboration

Another cultural challenge will revolve around the need for markedly greater collaboration. This will be needed in all directions -- within agencies, between agencies, with industry, with other countries (and other states, for state level regulators) and with other stakeholders.

Today's technology-driven world rewards high collaboration and punishes the lack of it. Entities that work largely in silos learn more slowly and act more slowly than those that break down walls, because the latter tend to do their work in linear sequence rather than joining workflows together in concurrent team efforts. They are also more at risk of making mistakes and producing suboptimal outcomes, because their work often has not been informed by all the input that could benefit it.

Today's regulatory bodies collaborate in many ways, but they tend to have cultures that maintain walls. Strategies for raising collaboration are discussed in more depth later in this section.

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[48] https://regulationinnovation.org/podcast/the-first-fintech-comptroller-acting-comptroller-of-the-currency-brian-brooks-on-his-first-day-in-office/

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Humans and Machines

One person interviewed for this paper spoke of people in these jobs gaining "superpowers" through use of AI.

Agency and industry cultures will struggle with widespread concerns about the risk of working with AI-era machines. These will take two forms: people will fear that machines will take their jobs, and they will worry that machines will do the work wrong.

On the former, the regulatory community should embrace the principle that the role of these powerful technologies is to equip and empower human beings. Robotics and AI will decrease vast amounts of routine work performed today, freeing up both regulators and compliance personnel to target their uniquely human skills on the highest-value objectives. One person interviewed for this paper spoke of people in these jobs gaining "superpowers" through use of AI. They will have vastly more information, more timely information, easier tools, and better analysis, when they have computers functioning as an extension of their own vital work.

Regarding whether the machines will get things right, agencies should build cultures grounded in an understanding that humans should not cede significant decision-making to them. Rather, experts should use technology to help prioritize their own efforts and enhance their work. They must also create standards and governance to shape how the activities of machines should be designed and how performance should be monitored with regard to accuracy and bias.

Field Examiners

For bank and credit union regulators, special attention should go into nurturing a tech-forward culture among field examiners. As discussed above, it is they who interface most with the regulated institutions. In any strategic change project, field forces tend to adopt new thinking more slowly than the headquarters people who are driving it.

> "
> ...utilizing ML and AI to analyze the data could free up supervisors' times to add the greatest value where humans excel over machines: judgement.
>
> - Former Bank of England Governor, Mark Carney

Talent Strategies

The culture change project will be intertwined with a human resourcing effort for recruiting, training and talent management strategies that empower innovators.

Training

Regulatory bodies should develop comprehensive education programs to train their personnel in technology knowledge and skills. All employees should have baseline training on core topics such as AI (including machine learning (ML) and Natural Language Processing (NLP); "big data" including the Internet of Things (IoT); cloud computing; open source code; blockchains and distributed ledger technology; cryptography; Application Program

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Interface (APIs); robotic process automation (RPA), privacy enhancing technologies (PETs); and concepts like Software as a Service (SaaS), agile workflow, and human-centered design. All staff should understand how these technologies are changing the financial industry and the regulatory process.[49]

Regulators may want to consider requiring everyone to take a basic class in writing code.

Much of the training effort could run through the existing training infrastructure of the FFIEC, which already has, for example, sophisticated training for IT examiners.

More advanced training should be required for selected leaders and teams, including use of outside schools and conferences. Agencies have been expanding their participation in fintech conferences like Money 20/20, LendIt Fintech, Finovate, the Innovate Finance Global Summit (IFGS), and the Singapore Fintech Festival. The last is sponsored by a central bank, the Monetary Authority of Singapore, and is the world's largest financial conference, attracting approximately 60,000 people in 2019. Regulators should also consider participating in non-financial technology conferences, such as South By Southwest, or SXSW, in Austin, Texas.

Another teaching strategy is to provide or encourage subscriptions to tech publications like *Wired* Magazine and *Fast Company* and urge personnel to listen to podcasts like Masters of Scale.[50]

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Agencies could also tap into the work underway at major universities to build cross-disciplinary skills between legal/regulatory expertise and the tech sector. In 2019, FINRA held a "buildathon" with MIT. Initiatives and programs are active at Georgetown Law, NYU School of Law, UNC School of Law, University of California Berkeley, Carnegie-Mellon and Yale, to name a few. Regulators could send personnel through such programs and could also tap into their pipelines of graduates.

Meanwhile universities could be encouraged to offer more cross-discipline courses. Technology schools could teach regulatory design and law schools could teach coding for attorneys. The legal and technology professions have many parallels. Both use specialized, precise language with nuances and structures that all the practitioners understand. Both "translate" unstructured information into these languages. Both build on foundations of widely agreed-upon standards and protocols. Both build on top of widely understood precedent material. The regulatory realm would benefit from having more high-tech attorneys and more lawyer-technologists.

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[49]AIR plans to launch a pilot of a Technology Boot Camp for regulators, which may be expanded in a second phase to financial industry personnel who work with regulatory matters

[50] AIR runs a podcast focused on innovation in finance and financial regulation, called Barefoot Innovation. Many agency heads, industry leaders, academics and others have been guests.

Talent Management and Career Opportunities

Regulators should undertake strategic projects to develop and empower technology talent. Position descriptions and job postings should be reviewed to incorporate requirements or preferences for technology backgrounds. New positions should be created, and old ones restructured and re-titled, to include technology and innovation responsibilities. Career pathing and skills testing should be revisited, opening accelerated promotion opportunities for people bringing technology skills into their work.

Agencies may also be able to pursue arrangements through which talented personnel could serve in short-term rotation in industry, at a high-tech nonprofit organization or at a company the agency does not regulate. Serving stints of, say, 90 days or a year could be transformative for both the individuals and their organizations. Another option would be to set up personnel exchanges or rotations with regulatory bodies in other countries that are working on cutting edge regtech.

While HR decisions must be age-blind, it is worth noting again that generational change is underway. Millennials are the largest generation in history and are digitally-native. The oldest are now 40 years old. Millions of millennials are poised to take on leadership roles at regulatory agencies, financial companies and everywhere else. Millions already have facility with technology that they do not put to use at the traditional organizations they work in. Placing them in leadership and change management roles will accelerate progress.

Recruiting

Agencies will also need to recruit some top technology talent to their ranks. This may be challenging due to pay scale limitations as well as a perception in the tech world that regulatory work is not interesting.

This difficulty is exacerbated in the United States due to the geographic distance between our centers of innovation versus regulation. In London or Singapore, regulators and tech leaders live in the same city and know each other. In the US, in contrast, Washington DC and Silicon Valley are 3,000 miles apart, and robust personal relationships across that expanse are few.

Fortunately, these recruiting issues can be solved. Agencies ranging from the UK Financial Conduct Authority to US bodies like FINRA, the SEC and the Commodity Futures Trading Commission[51] have been successful in recruiting large numbers of top-flight data scientists. The secret is that engineers and data scientists are attracted to solving problems that are interesting, and that are important. Financial regulation offers limitless supplies of both. Framing these challenges around combating human trafficking or preventing lending discrimination resonates with people who may not be intrigued by working on "compliance." Furthermore, the regulatory realm is essentially a green field, largely untouched by great technology. It can draw in great people.

Pay scales will be a challenge. However, the nature of the startup world is that many people cycle through firms, often gaining equity and flexibility along the way. Solving for this will not be easy, but is doable. Talent will attract talent.

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[51] This theme was discussed by former CFTC Chairman Christopher Giancarlo in a podcast he recorded with me on Barefoot Innovation. In a different episode, we discussed the same challenge with the FCA's heads of innovation and of regtech.

Regulatory leaders in the US and globally are already bringing this challenge to the center of their agencies. The Monetary Authority of Singapore is investing millions of dollars in regtech initiatives. As noted earlier, the UK Financial Conduct Authority has created a new division-

The UK Financial Conduct Authority has created a new division-level unit on regtech, regulation of fintech and data science, slated to have about 200 people.

level unit on regtech, regulation of fintech innovation and data science, slated to have about 200 people. The World Bank has several projects on financial regulatory modernization, as does the United Nations. All the federal US financial regulatory agencies have innovation initiatives underway looking at regulatory issues in fintech and, increasingly, at regtech. A number of states do as well.

Regulators may also be able to leverage special programs that enable "visiting executives" or "visiting scholars." Outside of the financial regulatory realm, some agencies are able to accept donated executives who are compensated by the donating company, or "dollar-a-year" executives who essentially donate their own time. Such arrangements would raise challenges regarding potential conflicts of interest, but might be possible.

Another option is to leverage and create technology-related "fellows" programs.

Regulatory bodies in the US and elsewhere face major constraints in recruiting in the form of government-wide rules for structuring and posting positions, evaluating applicants and, again, compensating them under set pay scales. Some types of recruiting have greater flexibility, in areas like hiring attorneys and veterans. Given the need for talent, regulatory leaders should make it a priority to explore options.

Digital Experimentation Strategies – Labs and Sprints

Innovation requires trying new approaches. When new things are tried, some will fail. And as discussed earlier under culture, failure is not a word that regulatory entities associate positively with their work.

Nevertheless, regulators will have to develop ways to experiment with innovation and to allow financial firms to do the same. Experimentation is one of the two strategies most crucial to accelerating change (the other is cross-disciplinary collaboration, discussed below).

This means that regulators will need ways to try and test new things, in controlled and safe environments that prevent risks from flowing into their larger work or into the industry.

Regulators throughout the world have been inventing ways to do this. The two most robust tools developed by regulators themselves are regulatory "labs" or "sandboxes" and regtech "tech sprints."

Labs and Sandboxes

The "regulatory sandbox" was invented in the UK (inspired by the CFPB's Project Catalyst in the US). Sandboxes are now in widespread use by regulators around the world and in several US states. These programs vary widely in design, but in general they invite innovators to conduct experimental projects under the regulator's scrutiny, in

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order to test or demonstrate features that could raise regulatory questions. The logic underpinning them is that many innovations that could benefit the public may not fit squarely, without ambiguity, into current regulatory frameworks. Some sandboxes allow regulators to waive or suspend regulations under these controlled conditions, although most aim more at clarifying how regulations may apply.

Importantly, existing sandboxes focus mainly on how to regulate *fintech*, rather than how to adopt and use *regtech*, since regtech's development has lagged behind fintech innovation. Our view is that the two goals should be merged since, as discussed in Exploration 1, the technologies involved, and the common information layer needed, are the same.

In the US, the term regulatory "sandbox" has sometimes stirred criticism for sounding unserious or implying that financial consumers are playthings. Some agencies have adopted alternative terms like regulatory "labs" or the more traditional construct of "pilot projects." Regardless of the preferred terminology, every agency will need the ability to try out new technology, in order to drive the "rapid learning" needed to keep up with today's pace of innovation. Traditional systems are not capable of producing this acceleration. The regulatory sector will have to innovate as the private sector does, by trying things on a small scale and learning and adjusting.

> Regardless of the preferred terminology, every agency will need the ability to try out new technology, in order to drive the "rapid learning" needed to keep up with today's pace of innovation.

Labs and sandboxes will need to be designed to assure consumer protection and to avoid creating regulatory loopholes. They can be thought of as "ring-fencing" risk, much as a medical laboratory tests new medicines in controlled environments in which patients are protected from harm, or as genetic experiments focus on preventing dangerous material from escaping into the wild. Regulatory labs should be built with an explicit priority on learning for the agencies, as well as the goal of clarifying areas where laws or rules may need to be modernized or novel approaches should be greenlighted. They need to be designed to protect the intellectual property of the participating companies. They need to avoid endorsing, or appearing to endorse, specific products. Their results should be communicated and then actively cycled into policymaking, so that learnings benefit the full industry and not just the companies involved in the test.

Where possible, these laboratories should be run jointly by multiple regulators, to foster joint learning and collaboration. It can also help for agencies to work directly with nonprofit organizations that can help develop experimentation and research, such as FinRegLab[52] and the Regtech For Regulators Accelerator (R2A).

Tech Sprints and Contests

While sandboxes have generally explored regulation of fintech, the "tech sprint" concept evolved specifically to innovate on regtech. Like sandboxes, the tech sprint concept was invented by the UK Financial Conduct Authority.

A tech sprint is essentially a hackathon. In this context the term "hack" is meant positively in the sense of problem solving or finding useful shortcuts, as in "life hacks." However, given the pejorative connotation of computer

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[52]As noted earlier, I chair the board of FinRegLab

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hacking, the FCA rebranded these events as tech sprints, or techsprints.

In the most prevalent version, the agency convenes regulatory domain experts, software engineers and sometimes academics; divides them into working teams; equips them with a pool of test data; and gives them a regulatory problem that might be solvable with new technology. Then it sets them loose to develop prototype solutions and write code. This is typically done on a "sprint" timeline, ranging from a few days to several weeks. At the end, the teams pitch their solutions to a panel of judges, which selects winners against criteria that were established at the outset. The "demo day" and judging often feature expert speakers and a larger audience of regulatory and industry leaders.

> In contrast to most regulatory problem-solving formats, the tech sprint produces more than ideas and white papers or working groups. The teams write code -- they create starter versions of actual regulatory technology. It's an essential tool in accelerating regtech learning and design.

One challenge in conducting many tech sprints is the need to furnish the teams with sanitized or synthetic data on which to build and test their tools. The UK is exploring development of synthetic data sets that could make this process easier. (Similarly, synthetic data could be helpful in evaluating some fintech products in the sandbox environment, by obviating the need to do testing on real consumers.)

Like regulatory sandboxes, the tech sprint model is spreading around the world. As noted earlier, FINRA held a "buildathon" last year with MIT (continuing a tradition that actually predates the FCA's sprints). The CFPB published a request for input in 2019 on conducting sprints and plans to do so, as do several other US regulatory agencies and the Department of Treasury. In 2020, the G20 and the Bank for International Settlements, with other partners including the Monetary Authority of Singapore, the Financial Stability Board (FSB) and the Regtech For Regulators Accelerator (R2A), is holding the first fully global regulatory TechSprint. They gathered ideas from central banks and regulators throughout the world and distilled them into three problem statements. Each carries a $50,000 prize for the competitor that designs the best regulatory solution.

The prize concept has also been embraced by the CFTC, which in April 2020 launched Project Streetlamp, its first initiative using the Science Prize Competition Act of 2015. This is a sprint-like tool available to most or all agencies and enables them to conduct contests and award prizes for solutions to regulatory problems. It is also possible that regulators could work with philanthropic organizations to offer the equivalent of a regulator XPRIZE or the Ted Audacious Project. These crowdsourced solution models present their own challenges, but can infuse fresh technology thinking into regulatory efforts.

Other ideas are emerging as well, including the potential to use "threatcasting" exercises adapted from military planning.

Of the FCA's seven techsprints conducted to date, the most conceptually ambitious was a successful two-week exercise in late 2017 to explore the feasibility of machine-executable regulation -- that is, rules issued in the form of computer code. The results were fed into a development project on Digital Regulatory Reporting, or DRR, which has already been partially deployed and is being further developed.

Self-Implementing Regulation

On December 1, 2017, the UK Financial Conduct Authority and the Bank of England ran a test on the concept of "machine-executable regulation" -- whether some regulations could be issued, not in words, but in the form of computer code.

Working together for two weeks in a hackathon format, teams of government, banks, tech firms and academics produced an experimental block of code. On the final day, they applied it to a set of test data in hopes of generating an accurate regulatory report regarding retail loans.

The experiment worked, yielding a correct report in just ten seconds. The FCA is now building out this technology, which can potentially produce self-implementing compliance for some regulatory mandates.

At the culmination of the test, the people in the room leapt up and cheered. One participant said the test had succeeded, "beyond our wildest imaginations."

In July 2019, the FCA collaborated with us at AIR to conduct a simultaneous sprint in London and Washington DC. The Washington event directly engaged scores of US regulators in new technology concepts for fighting financial crime. FDIC Chairman Jelena McWilliams keynoted the event and served as a judge.

As more agencies adopt the sprint model, many variations are evolving. The FCA has issued a report on tech sprints and AIR has released a manual on how to conduct one. AIR is also publishing a white paper on the FCA's innovation program in the summer of 2020.

Other Experimentation Strategies

Regulators can learn from many other techniques that are routinely used by software developers to enable rapid testing, evaluation and adjustment of products. These include A/B testing, feature flags, beta testing, and fast rollbacks. Not all of these may be adaptable to a regulatory environment, but some, in some form, may be tools for safe acceleration of regulatory change.

Collaboration Strategies

Regulators have two high-leverage tools for accelerating innovation, especially in the learning phase. One is using small-scale testing, as discussed under Experimentation Strategies, above. The other is to ratchet up collaborative activity with all types of stakeholders. In a fast-changing environment, learning must be pursued actively in collaborative formats that are rich in discussion, live brainstorming, and sharing of ideas and emerging best practice, across silos.

High collaboration does not come easily to most financial regulatory bodies. Many tend to be guarded in how they share information. While they interact well with the industries they oversee, regulation is still an inherently adversarial relationship that limits many kinds of communication. In addition, agencies often hesitate to share information and to collaborate with each other.

Today, typically, regulators communicate externally in channels that are usually written and linear. For example, if they plan to issue a new regulation, they go through numerous sequential steps, following rigorous rules. In general, these activities are built on a notice and comment structure in which agencies ask for input or propose rules, invite written comments, read them, refine their thinking, and go through further rounds of notice and inviting of input. This process is of course highly valuable, and also has the benefit of transparency. However, it can take months -- often more than a year -- from start to finish. And even if it is supplemented by hearings or meetings, the communication is mainly formal and arms-length. There is little chance to get into a room with thoughtful people and simply brainstorm.

The same is true for interagency collaboration. The multiple federal financial agencies in the US have several formal channels for routine communication and cooperation, but most of their work happens within their individual agency walls. This is partly because it is easier, and usually faster, for each to do things alone. It is also due to their varying histories, missions and cultures, including deep organizational pride at all of these entities.

Regulatory agencies also face legal constraints on their ability to interact with others, especially the industries they regulate -- a topic that will be discussed below under Legal and Ethics Strategies.

All of these obstacles will have to be addressed if regulators are to keep pace with the challenges ahead. The following are several strategies for doing so.

"The Room Where It Happens"

Paraphrasing the *Hamilton* musical, the single most important collaboration strategy for regulators is to get tech people into the rooms "where it happens" -- where regulatory policy is being designed and implemented. The perspective of digital technology expertise is the most critical missing ingredient.

When I was a senior fellow at Harvard we convened an international regtech conference of about 60 people. I asked for a show of hands on how many participants had written parts of laws or regulations. Many hands went up. I then asked how many attendees could write code. Numerous hands rose. Then I asked how many could do both. There was just one person with this dual knowledge.

> Paraphrasing the Hamilton musical, the single most important collaboration strategy for regulators is to get tech people into the rooms 'where it happens' -- where regulatory policy is being designed and implemented.

The regulatory experts in the room that day were seasoned veterans, many with decades of experience in crafting and executing regulatory solutions. They knew they had problems with making regulations work effectively and efficiently, and assumed it was impossible truly to solve this except at the margin. The technology attendees, on the other hand, had the solutions, but didn't know the problems existed. Or if they did, they thought -- wrongly -- that these problems are not interesting.

> In meetings like these, it can be useful to declare an "acronym-free zone," since both regulation and technology are dense with specialized terminology and acronyms. It can be a sign of a good meeting when these need to be translated because the attendees are truly diverse in their backgrounds.

Very few individuals have both regulatory and technology domain expertise in their heads. The biggest advances for regtech will come when people who have one realm of expertise work closely with people who have the other, and discover that seemingly insoluble challenges can now be solved.

Internal Collaboration and Agility

A top priority should be to raise collaboration levels within each agency by converting the default operating model from traditional "waterfall" work flows to the "agile" format. In a waterfall system, tasks move sequentially from one department to the next. In a bank, for instance, a new product idea might arise in the business line, be tested in marketing, go back to teams in the business line and IT for operational design, and move on to review in legal and compliance, go back to marketing for promotional design and rollout, and so on. In an agile environment, people from all these units would work together on the project. They would divide the work into small chunks, typically with one-week timeframes. The team would "sprint" on these tasks, reviewing at a daily "standup" and a weekly check in or "retro" to review what has been accomplished and what problems are arising. This fast iteration condenses the time required from beginning to end, because ideas and problems are surfacing quickly, and work is getting done simultaneously rather than sequentially.

This is how most software is created. In banking, large institutions have moved to agile methods in recent years, but the method has not taken hold widely in the financial industry and its regulators.

Interagency Collaboration

The United States has a particular challenge regarding interagency work because it has a uniquely complex structure featuring multiple, often overlapping financial regulatory bodies. Five separate federal agencies directly supervise depository institutions. Several dozen more get involved in financial regulatory matters. In addition, the fifty states and the US territories regulate banks and nonbank financial companies.

This complexity is a factor in the slow pace of regulatory change. The bank supervisory agencies have several standing channels for collaboration, but these are limited. If they try to act in concert, interagency dialogue typically adds months and sometimes years to decision-making processes. When agencies act individually with low coordination in areas where their domains overlap, the result is often a deceleration of compliance by the industry, as companies work through complex questions of multi-agency coverage and interpretation.

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It seems clear that few people would design the system in this form if we started over today, but changing it is politically unlikely.

To speed up, therefore, regulators will have to collaborate much more efficiently with each other. This may require development of new models for interagency dialogue and action -- new "connective tissue" that leaves current structures in place but links them together for easier mutual learning and action.

Such linkages can take many forms, and multiple strategies should be pursued simultaneously. Agencies can form joint task forces on various aspects of innovation. They can bring innovation topics into standing channels like the FFIEC and FSOC. The Treasury Department has extensive convening power to orchestrate agencies in working together. The Treasury or the White House might, for instance, appoint a regulatory innovation "czar" type of role, to coordinate agency innovation units and perhaps lead a task force.

Agency innovation units could join together to hold their "office hours" sessions, in which they meet with and listen to innovators. Agencies could also consider launching joint labs, or having their existing sandbox-type initiatives select one or two projects on which to work together. Two or three bank regulators could join together in a tech sprint, or could join with FinCEN in running a sprint on financial crime.

Easier to implement would be forming a habit of simply meeting over a meal on a regular basis. Some of this occurs today organically, but expanding it can speed up collaborative learning.

High collaboration among regulators tends to speed things up in the learning phase, but slow them down when it comes to taking joint action. It may make sense to use the former to build up the connective tissue, and then apply these new models and newly-formed or strengthened relationships to tackle harder problems together over time.

It is possible that a silver lining in the pandemic crisis will be acceleration of interagency action. In the spring of 2020, the financial regulators issued numerous – by one count, more than 30 – joint statements in just a few weeks, spurred by the emergency need.

Interaction with Industry

To be able to learn faster and act faster, regulators would have to develop more fluid ways to interact with the businesses they oversee and would have to help those business, themselves, modernize. Some strategies for this are as follows.

Building a "community of practice"

Regulatory modernization will require development of a community of practice through which regulators (from all agencies), regulated firms, vendors, tech firms, advocates, consulting and law firms, academics and others can pool learning, skills and sometimes projects. The agencies will have to create environments in which they can readily communicate with industry, learn from innovators, learn from businesses that struggle to innovate due to regulatory constraints, learn which solutions might be easier or harder for industry to adopt, and the like. The people working on these efforts should know each other and constantly learn from each other, while carefully

maintaining the regulators' independence.

Broadly speaking, regulators in countries that have led the way in regulatory innovation cite this informal community-building as a key factor in their success. Nick Cook, the then-head of regtech for the UK FCA, told a US audience in 2018 that his agency had seven people

> " Innovation In fintech and regtech requires intensified collaboration, which gives London a geographic advantage. We have the 'Tech' of the US west coast, and the 'Fin' of New York City, and the 'Reg' of Washington, DC, and we're all within a 20-minute taxi ride. We see each other all the time. We know each other.
>
> - Lawrence Wintermeyer, former CEO, Innovate Finance, London

working on regtech, but hundreds of other experts helping them, including some of the top British experts in data and AI. The agency succeeded in enlisting such people in a series of projects over several years that built an innovation network motivated by the win/win potential of regtech to drive up desirable outcomes and drive down costs. The UK's Digital Regulatory Reporting project, described in the Manifesto's appendix, is an example of a public-private collaboration that arose out of the 2017 Tech Sprint on machine-executable regulation.

Regulators throughout the world have adopted models of "co-creation" with industry for these new frontier regulatory challenges.

In the US, agencies have taken steps toward building this kind of community, in many forms. For instance, in May 2020 the OCC held three virtual "listening sessions" to gather questions and concerns about the SBA Paycheck Protection Program, which had been recently launched to rescue small businesses impacted by the pandemic (and which operates mainly by having banks extend forgivable SBA-guaranteed loans). The sessions were hosted by the OCC's innovation unit and attracted many banks, fintechs, and regtech firms. The agency subsequently issued a report on what it learned and is likely to continue with the listening session format on other topics. US agencies are holding forums on technology topics at increasing rates as well. Every time a project or gathering connects regulatory and technology people, the community expands.

Clearing obstacles to industry collaboration

Many obstacles impede regulators' ability to build a community of practice that includes people from industry. Some of these are grounded in laws and government processes.

Regulators and regulatees have complex relationships. On one level, they normally want similar things. They often work collegially, both on specific company issues and at the policy level. Nevertheless, these relationships carry inherent tensions, by design. Businesses do things that their regulators must sometimes challenge, criticize and penalize, and regulators must always be careful to maintain both independence and the appearance of independence in dealing with individual firms and the industry. Numerous rules exist to help assure this arms' length model is followed, including conflict of interest steps that require regulators to recuse themselves from matters that might affect them and that inhibit "revolving" door job changes between industry and agencies.

In early 2020, AIR issued a report entitled, *Financial Regulators' Dilemma: Administrative and Regulatory Hurdles to Innovation*, prepared on a pro bono basis by the Buckley law firm for AIR and the Omidyar Network's financial inclusion affiliate, Flourish Ventures. The report outlines a range of laws and protocols that make it complicated for regulators to talk with and learn from industry.

For example, if an agency wants to create an advisory committee, it must comply with the extensive requirements of the Federal Advisory Committee Act, or FACA. If it doesn't want to set up a standing advisory committee, and instead wants to hold a series of conversational roundtables or attend convenings hosted by others, it has to be sure not to trigger FACA's requirements inadvertently. If it wants to survey industry for input or information, it must negotiate the hurdles of the Paperwork Reduction Act.

If a regulatory official wants to call up an industry person to brainstorm innovation ideas or understand how something works, he or she must keep in mind that the record of this call, and emails of this nature, may become publicly disclosed under the Freedom of Information Act, FOIA, as part of some future unforeseeable controversy. The agency must also worry that by inviting innovators into a sandbox process, the companies' proprietary intellectual property could become subject to FOIA demands from competitors, despite rules that are intended to protect it.

Suppose regulatory officials want to pilot test a new regtech technology, instead of just seeing a briefing or high-level demo on it. They may be obligated to launch a full procurement project involving competitive bidding and months of process, even though they don't actually want to purchase it agency-wide. If, instead, they are given an opportunity to try out such pilot tools for free, they could be violating the Antideficiency Act's bar against taking gifts. There is much more.

> **Suppose regulatory officials want to pilot test a new regtech technology, instead of just seeing a briefing or high-level demo on it. They may be obligated to launch a full procurement project involving competitive bidding and months of process, even though they don't actually want to purchase it agency-wide.**

Some government-wide rules do not technically apply to the financial regulatory agencies that are independent and not funded through appropriations, but these agencies generally follow the processes voluntarily, as best practice and to avoid criticism from their internal Inspectors General.

All of these rules were put in place for good reason, but all were written in and for the pre-Digital Age. The Antideficiency Act was enacted in 1884. A regulatory modernization project should include exploration of ways to enable more agency flexibility, including for interaction and collaboration with regulated industries, while safeguarding independence and transparency. As noted, other countries have struck a successful balance between regulatory distance and active communication.

Engaging the legal and compliance communities

Agency collaboration with the legal and compliance professions will be a key lever of acceleration. These industry

experts have evolved highly sophisticated and specialized skills and infrastructures that guide how the financial industry manages risk and regulatory compliance. They have full-spectrum professional standards and tools, including certification programs, schools and conferences, and well-established best practices and models for risk controls. These have generally evolved through collaborative efforts of regulators and industry together over decades, with high engagement from consulting firms, law firms and standards-setting bodies.

All of these should be updated for the Digital Age. This is unlikely to happen on any scale until regulatory bodies signal active support for change and engage in dialogue.

Most of these processes work through trade groups. In some parts of the world, regtech associations are forming. For example, there is a UK-based RegTech Council and a Europe-based International Regtech Association, both of which interact extensively with governments. The UK also has a trade association called Innovate Finance, which has both fintech and bank members and which was founded at the express urging of the British regulators.

Fostering industry readiness

Agency collaboration with industry should proactively foster financial companies' capacity to adopt new technology. Industry readiness today is dramatically uneven. In general, fintechs are at the forefront of capability due to their digitally-native technology and rich data. Large banks are also becoming increasingly able to adopt change. Small community banks and nonbanks like traditional finance and mortgage companies are least prepared. Their inhouse technology resources are limited, and banks are also constrained by reliance on vendor-provided legacy core IT systems that limit their ability to adopt new tools.

As discussed below under Sequencing Strategies, some regtech can be introduced as a voluntary option, so that companies can adopt it at the point where it will make their compliance work less burdensome. However, if community banks are not able to take this opportunity, regtech's evolution could increase, rather than decrease, their competitive disadvantage in compliance burden. Quoting again the Protiviti/IRTA KYC report, "Regulators should foster a culture of tech activism rather than one that is tech-agnostic."

International Collaboration

International collaboration will be more important than ever in a regtech-based system. Many regulatory functions are increasingly global, such as combating the rise of international financial crime. In addition, the US can learn from and build on other countries' regtech work. Partly because of the complex regulatory structure in the US, many other countries are more advanced in evaluating and embracing regtech.

In 2018 a British official told a New York conference that European bank regulators were opening innovation channels and agreements with other countries but that, for the United States, no one knew what agency to contact.

Sparked by the FCA, the international regulatory community has launched GFIN, the Global Financial Innovation Network. It is comprised of a growing number of regulatory agencies throughout the world, including a number from the US federal government and several states. Bodies like this can lay down groundwork for building multi-

country collaboration that will enable rapid learning and harmonized action toward regtech systems. As discussed earlier under Experimentation Strategies, regtech work is also engaging international bodies like the G20, the Bank for International Settlements, and the Financial Stability Board.

Regulatory leaders also should be proactive in helping to educate legislative policymakers on regtech, in order to assure that any statutory changes are grounded in deep understanding of technology opportunities and risks.

Independence

An exciting aspect of regtech is its potential to create "win/win" outcomes that can produce better results at lower costs, benefiting stakeholders across the full spectrum of interested parties. However, some members of the ecosystem will experience disruption nonetheless. Many will undergo substantial transition costs and in some cases, loss of dominance in particular business niches. There are companies whose business models have been developed specifically to leverage shortcomings in the current system.

Policymakers should work against the risk of vendor capture, rent-seeking strategies, lock-in of rigid technologies, and tactics aimed at defending existing franchises. They should assiduously avoid adoption or seeming encouragement of closed, walled-garden solutions or solution sets that are not interoperable with others. They will need to be especially vigilant as they simultaneously embrace models of rising collaboration with industry, as discussed above.

Sequencing Strategies

Conversion to a digitally-native design will take years and in some areas, decades. In practice, most changes will be adopted sector by sector, prioritized based on urgency, value, consensus thinking and ease of implementation. Regulators face enormous challenges both in envisioning the needed regtech system and in knowing how best to navigate toward it. The end state is not yet clear to even the most advanced regulatory reformers. Even if it were, agencies would struggle to determine the best sequence of steps for pursuing it.

Given the enormity of the challenge, regulators need methods for getting these efforts into workable sequences, both for exploring innovation and for implementing it.

"Thinking Big and Starting Small"

Looking at the vast work ahead, agencies often get stuck on the problem of figuring out where to start. The main answer is that it doesn't matter much. There is no one best approach. The key is to start somewhere, learn from it and advance from there.

A strategy for this is to "think big, but start small." Every major regulator initiative discussed in this paper began with very small and concrete steps. These were usually tentative and uncertain. Simple little projects put down seeds that grow. Very often, regulators find that once a starter step has been taken, suddenly the next step reveals itself, even though it was not visible from square one.

One US agency tells of setting out to digitize its rulebook by launching a project to sort out the taxonomy of the terms used in it. They chose one small section of guidance and launched a decidedly low-tech project in which several people sat in a windowless office for several weeks, reading the rule and entering the varying terminology they found into a spreadsheet, to begin to build common definitions that a machine would be able to read and interpret.

One useful tool for finding starter work is simply to array ideas and map them on two dimensions – ease of exploration/implementation, and potential impact. Start with initiatives that are easy, but that can lead toward major payoffs.

Taking small, practical steps can help agencies build up cultural comfort with innovation and even a bias for action, driven by the insight that remaining passive until matters become clear is both futile and dangerous. As quoted earlier in the Manifesto, The FCA's Nick Cook has argued that the wait-and-see stance amounts to "accelerating backwards."

This process ties to the earlier discussion of experimentation strategies – the importance of starting with doable steps and learning from them.

Prioritize initiatives that are easy to launch and can lead to high impact
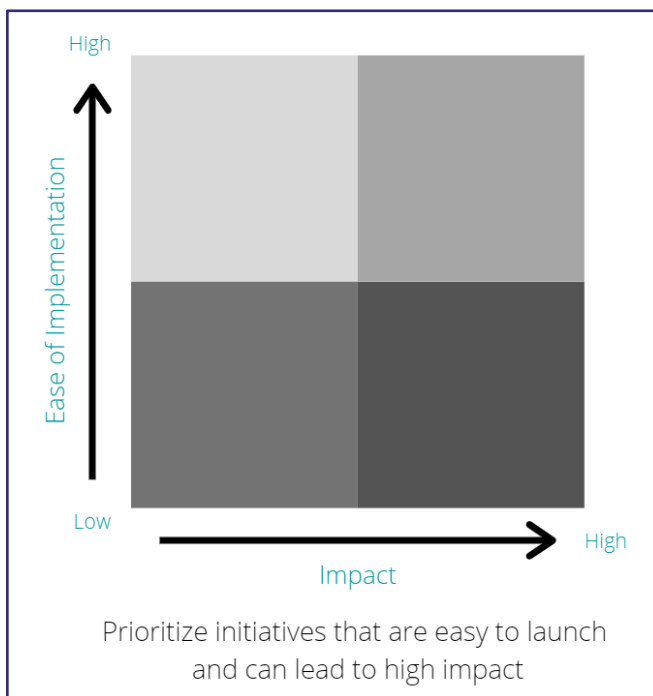
As modernization begins to create new platforms, tools and data, the agencies will experience natural acceleration and a version of "network effects" -- the ability to scale up faster as more users are attached to a system and can find and create value in it. Furthermore, getting data into digitized form to address one area of regulation will create information that can then be accessed for other purposes, fueling a cycle of accelerating change.

Sequencing for Industry Readiness

As noted earlier, financial industry digitization, including in risk and compliance functions, is uneven. In many cases, fintech companies are the most advanced players because they are almost by definition digitally-native themselves, and many large banks are also well along in converting to new systems as well. The slowest progress is generally at smaller banks and older nonbanks.

Small banks, in particular, face constraints on budget and skills that will make regtech adoption challenging. Conversely, however, they also may have the most to gain from successfully making the transition, and the very fact that they are small organizations makes them nimbler than, say, a global bank. As discussed earlier, the conversion will be eased greatly by their migration into cloud computing environments, which has begun at many institutions.

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Development of digitized regtech systems should be customized for the readiness of the industry to make the change. Adoption will be a complex and multi-year process that will proceed at different rates in different industry segments, for different regulations, and for different types of companies and activities, and their regulators. A common scenario is to look for "shared pain points" between industry and regulators, and start there.

Optional Regtech

The regulatory world will have to innovate in the same way businesses do -- by planting small new initiatives on the side of the legacy system and letting them grow there, rather than trying to overhaul cumbersome, entrenched mainstream organizations and workflows, top-down. Large organizations tend to have "immune systems" that detect innovation and attack it with antibodies. Early innovations need to be protected as they take root. If they prove themselves, they will gradually compete successfully against the older systems and may eventually overtake and replace them.

In regtech, this principle suggests that some new methods should be offered to industry as an option, not a mandate. That approach can have two benefits.

> Some new methods should be offered to industry as an option, not a mandate.

First, it gives regulators room to learn by doing, as their regtech activities grow organically and can be refined through experience.

Second, it can reduce the problem of industry resistance, including political resistance. Most regulatory changes impose substantial transition costs. This means that industry often opposes them, even if they might support them in theory. Business leaders worry that the outcome, even if marginally better, will not be worth the expense of switching over. They also realize that once an issue is opened up for regulatory or legislative change, the process can take on its own life and may ultimately produce outcomes far different from those originally intended.

Optional regtech can also solve for the problem that industry readiness is uneven, as discussed above.

In an optional system, regulators would open up a new "regtech" channel for a certain area, alongside the existing one, and let regulated companies opt into it voluntarily. For example, regulated industries might be given the option to report data in digitized format through an API, instead of submitting traditional reports, or could even choose to give the regulator full access to data in real time on a given topic. For some companies, this approach could be considerably easier than compiling reports.

Another example might be having regulators set standards for acceptable performance in a given area and letting companies provide access to data that could show compliance with them. To incent participation, the regulator could reduce its traditional scrutiny, including its expectations for process-based compliance, such as evaluation of a bank's Compliance Management System. In effect, the regulator's stance would be that if the company is clearly meeting the required standards, as proven by its data, the supervisor need not care how it accomplished that outcome.

Again, offering options like this should start with very small-scale experimentation and then expand based on experience. One method is to start ideas in sandbox or lab environments, and graduate some of them into incubators and then evolve them into alternative channels.

The optionality strategy would not work for all regulatory areas, including ones where regulators are trying to gather information from the whole industry on a standardized basis and need to be able to access and use it all.

Solving Tech Problems before Policy Problems

Another key sequencing strategy is to separate the technology questions involved from the related legal and policy questions. Both are complicated, and mixing them together can paralyze problem-solving. As noted earlier, a common scenario is that the needed technology for a given regulatory problem already exists but has not yet been applied to the topic at hand, and/or is unfamiliar to regulatory decision-makers. In such cases, it can make sense to run tests of new technology to determine whether it offers better solutions. If it clearly does, the agencies can then circle back to whether changes would be needed in rules or regulatory processes to enable adoption. This second discussion is easier if there is empirical evidence of the value of exploring it.
This is another reason why testing is a critical regulatory tool.

Situations Involving New Requirements

Some regulators are finding it useful to introduce regtech in scenarios where the industry is becoming subject to a new regulation or major revision of an old one. In these situations, financial companies will have to undertake extensive work anyway to convert IT systems. This reduces the costs that will be generated specifically by a new regtech system and, therefore, can diminish resistance to adoption.

Building on Success

Another sequencing strategy is to find places where other regulators have already begun solving a common problem and follow in their footsteps, rather than blazing new trails through difficult terrain. In some areas, regulators are even writing open source code to solve challenges. Other agencies may be able to pick this up, adapt it to their own needs, and build it further in open source formats, so that the next regulator can benefit from the last one's efforts.

Legal and Ethics Strategies

Conversion to regtech will surface many current financial laws and regulations that conflict with desirable change. These projects will require extensive legal work regarding both the regulations affecting financial companies and the laws and regulations impacting the agencies' own activities.

Barriers to Industry Innovation

Many barriers will arise in the laws and rules governing the permissible activities of financial companies. As one example, when a customer is denied a consumer loan, the Equal Credit Opportunity Act and Fair Credit Reporting Act require the lender to disclose the "reason for denial." This made sense in the analog era, but is creating concerns for lenders that want to use richer data and machine learning to analyze loan risk, including as a financial inclusion strategy, since these analytical tools generally do not yield one clear cut "reason." Policymakers who

want lenders to be able to use these new methods will face two challenges. They will have to adjust the disclosure mandate to fit new techniques while still giving consumers useful information about how to improve their creditworthiness. They will also have to be sure that these new risk analytics are fair and nondiscriminatory. Challenges like this thread through many or most financial regulations and will need thoughtful attention as they are identified.

A key factor in lowering barriers to industry innovation is the need to modernize third-party risk management rules for banks. Appropriately, bank supervisors have set high standards regarding entities that will work with banks as vendors, partners or in other arrangements such as for referrals or marketing. In general, the bank must assure that these third parties will perform as well as the bank itself would in areas like security controls and compliance with consumer protection requirements. Banks thoroughly vet potential vendors and partners at the front end and must also monitor their performance once these deals are in effect. The front-end due diligence processes are highly complex and can take months, and even a year or more. This undermines the incentives on both sides to pursue bank arrangements with fintech and regtech firms.

Clearly these risk standards cannot be "lowered." At the same time, they have become a major barrier to innovation. As discussed earlier, digital innovation is driven largely by fintech companies. Banks need access to their tools – especially smaller banks and credit unions that have limited tech resources of their own.

Regulators should undertake projects to resolve this dilemma, finding new ways to enable digitally-native innovation while maintaining safeguards. Some of this will involve signaling support for banks to conduct testing with innovators, perhaps under standards the agencies set in order to assure sound practice and to build industry comfort that these efforts will not be second-guessed by examiners.

Barriers to Innovation by Regulators

A second arena of legal design factors focuses on the ability of regulators, themselves, to innovate. One timely example has arisen in the pandemic, as some agencies have shifted to working through off-site methods, while having to comply with statutory mandates to perform examinations onsite.

As discussed under Collaboration Strategies, the Buckley law firm undertook a *pro bono* research project in 2019 for Flourish Ventures, an affiliate of the Omidyar Network and AIR, to study existing federal laws and protocols that impede adoption of innovative technology by regulators. The project included interviews with a range of agency leaders, who reported substantial difficulties in conducting activities like pilot testing software, studying regulatory issues, inviting experts to conduct briefings, and meeting with parties from whom they hope to learn.

All of these laws and processes have worthy goals, but all were written in and for the analog age, at a time when slower-paced change generally worked better than it can today. It may make sense to revisit them to find ways to preserve the important roles they play, while still allowing more ready innovation. The Buckley paper is *Financial Regulators' Dilemma: Administrative and Regulatory Hurdles to Innovation*.

Ethics Frameworks

As discussed in Exploration 4 on principles, a regtech transformation should be grounded in clear ethical precepts, especially because statutory and regulatory change will almost inevitably lag behind accelerating technology in many areas, leaving legal gray zones for long periods of time. Agencies may want to create explicit ethical frameworks for dealing with issues like data privacy, ethical AI, maintaining independence, and interpreting legal boundaries on their own power.

Cost Management Strategies

As discussed earlier, regtech solutions should generally not be pursued unless they credibly offer major gains in effectiveness and/or reductions in cost. Marginal improvements generally will not be worth the transition costs of adopting them, and will also tend to engender political opposition. Policymakers should therefore undertake rigorous and credible methods for assessing the cost/benefit equation.[53]

Where costs of transition are worthwhile, regulators will need to quantify them for both agencies and industry and may want to explore strategies for defraying them.

It is worth noting that regulators in several countries have been able to make impressive progress on regtech with very small staffs, by working collaboratively with industry and tapping into the technology skills and resources of large companies, as well as academics. Obviously, such relationships need careful management to avoid compromising regulator independence. However, when there is a clear alignment of regulatory and private interests, it can be both appropriate and highly efficient for regulators to host or guide projects that rely heavily on industry expertise.

There may also be opportunity for agencies to save money by joining together to tackle projects that could produce shared and interoperable results, pooling resources and leveraging each other's expertise.

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[53] See UK FCA report on cost/benefit assessment for Digital Regulatory Reporting (DRR) January 2020.

As discussed below, policymakers may also want to explore setting up a Federally Funded Research and Development Center, or FFRDC, to conduct some of this work. This could help defray costs because these bodies can accept funding from outside sources.

As the system gradually converts to regtech over time, it can be expected to reach a "tipping point" where changing becomes easier than not changing, because the larger environment is operating with a new set of common technology and because, as discussed earlier, the system develops network effects.

Exploration 5: Strategies for Converting to Digitally-Native Regulation
Questions for Commenters:

- What are the greatest barriers to practical implementation of a regtech system?

- What are the best ways to overcome these obstacles?

- Of the strategies outlined in this section, are some particularly promising? Are some especially problematic? How could they be improved?

- Are the strategies presented realistic -- can regulatory bodies actually pursue them? If not, why? What would work better?

- Does the section omit promising, practical strategies?

- What suggestions do reviewers have for facilitating regtech implementation?

POTENTIAL ROADMAPS

The Regtech Manifesto is offered as a Request for Comment (RFC), grounded in an acute appreciation that its ideas are highly preliminary and need to be challenged, refined and developed by a community with diverse kinds of knowledge.

Nevertheless, it seems worthwhile to try to distill the material in this paper into a step-by-step framework for how an agency might approach actual exploration and implementation of a project to begin conversion.

A core question facing regulators is where to position their project on the spectrum ranging from more careful and incremental to more bold and rapid.

Below are high level outlines for each, offered with the recognition that there are numerous other paths that can work. These might be thought of as options for the main road.

Roadmap One: Incremental Change/Single Agency/Twelve Months

For agencies that want to start small and build incrementally, a game plan could be designed as follows.

Step 1: Combine or connect current innovation units

Begin by identifying all the groups at work on regtech or suptech, fintech innovation issues, cloud computing and data science. Either combine them or envelope them in a task team superstructure that brings together their respective efforts.

Step 2: Convene a team and appoint co-leaders

Whether or not the regulatory innovation groups are formally combined, set up a regtech task team that includes them all and appoint two co-leaders. One should be the agency's leading expert on digital technology, if possible, and a person with a technology background (shorthand test: can they write code?). If the agency is a bank regulator, the other leader should probably be a senior supervisor. If not, it should be someone deeply expert in the regulatory functions of the agency. IT should also be represented in the group.

The regtech team should meet frequently with the head of the agency and, for bank agencies, the head of supervision.

This team should organize and help lead the work outlined below.

Step 3: Develop a strategic plan

Have the task team undertake a strategic planning exercise with the classic elements -- articulating the agency's regtech mission, engaging stakeholders, fact-finding, and establishing goals, timelines, accountabilities and resources.

Engage a consultant with technology experience and incorporate tech-world experiential learning in the planning process.

The strategic plan should emphasize how the agency wants to change its culture, and how it will go about doing so. Emphasize involvement of millennials and, for bank supervisors, the field examiners.

Step 4: Create a talent plan and plan for culture change

Recruit talent from the technology or regtech world, launch a comprehensive training program, and realign structures, roles and job standards to promote and empower people with tech skills. For banking agencies, emphasize training for field examiners.

Focus specifically on getting tech people into the "room where it happens" for regulatory policymaking.

Step 5: Accelerate the transition to cloud computing

The task force's planning should include a focus on how to responsibly accelerate the agency's plans for transitioning to a cloud computing environment and becoming a data-centric, digitally-native organization.

The task force's planning should include a focus on how to responsibly accelerate the agency's plans for transitioning to a cloud computing environment.

Step 6: Establish or expand a regtech accelerator and launch an initial proof of concept project

If the agency innovation program focuses on fintech rather than regtech and does not include a regtech experimentation and testing function, create one. This initiative can have a fintech sandbox under the same organizational umbrella, but should have an explicit regtech purpose and capacity.

Have the regtech lab launch one or more starter projects for regtech. Begin by holding a tech sprint within 6 months. Start with a simple problem and format. Use a prioritization grid that maps ease of action on one axis and potential impact on the other, and choose topics that are easy but that can align with high-impact results over time.

If possible, choose a project that begins to move regulatory activities to a platform architecture built on open source code.

Use the sprint to seed the community-building of Step 7 and to foster rapid learning by the agency and industry about the potential of new technology.

Coming out of the sprint, create an incubator project that develops the most promising solution/s into a working prototype or proof of concept for tackling a key regtech challenge. To the extent possible, involve industry and academic participants in this effort.

Step 7: Begin building a regtech community of practice

The regtech team and the agency in general should create new ways to accelerate learning through interaction with industry – both regulated institutions and vendors – and with other entities like academics, consumer advocates, law enforcement, Congressional staff, other regulatory agencies and GFIN. Engage them in sprints,

incubator work, brainstorming efforts, conferences and roundtables, and work on intellectual capital.

This work should explicitly include building industry readiness to adopt regtech. The agency should convene and participate in events and projects to foster that process.

Step 8: Accelerate industry regtech testing and innovation

Proactively communicate that regulated companies are encouraged, and where appropriate, expected, to explore better technology solutions for compliance (and, for banks, for safety and soundness risk management). Communicate clearly that companies should undertake this effort through experimental work similar to the agency's own regtech sprints and accelerators.

Create legal and cultural safe space for companies to pilot and test new solutions in contained environments. This needs to include assuring, for banks, that field examiners share in encouraging testing and innovation.

It also needs to include guidance on adjusting bank third-party risk due diligence requirements for regtech *testing* purposes. Consider providing guidance on how to conduct testing that meets regulator standards.

Where possible, encourage regtech experimentation through interagency issuances, as regulators have recently done on AML and cash-flow loan underwriting.

> **A desirable outcome would be to have most banks and credit unions, and many other companies, actively testing and piloting regtech within one to two years.**

Step 9: Undertake a legal review

Undertake legal research on factors that could impede regtech modernization for both industry and regulators in general and in the priority areas being explored through the proof of concept project. Begin socializing areas that may need legal modernization.

Again, this review should include revisiting third-party risk guidelines and practices.

Step 9: Reach out to other agencies

Seek opportunities to engage with other agencies in regtech learning and sharing of work. Where possible, develop joint events, learning sessions and projects.

Step 10: Establish a high profile

Without overpromising on results, make this work high-profile, internally and externally. The agency head should present major speeches on it and do media interviews about the initiative. Influential audiences should be invited to events. Learnings and progress reports should be communicated in forms that are easily accessible and can rapidly engage people widely, online and through convenings. Internally, the agency head and senior executives should be visible in training forums and projects aimed at culture change.

Roadmap Two: Accelerated

If a bank regulatory leader wants to move aggressively to an accelerated regtech conversion, he or she might take the same steps outlined in Roadmap One, but add two more.

First: Enable and foster integration of banking, fintech and regtech

The fastest route to modernizing finance and financial regulation is to move swiftly toward a system in which banking and fintech become highly integrated and most financial companies become rapidly equipped to use cutting edge, digitally-native regtech. Lower-tech financial institutions should have clear, permissible routes for bringing fintech into operations. Financial institutions of all sizes should have clear pathways for onboarding high-tech solutions for both their business and compliance activities.

As discussed earlier, this strategy would require updating regulatory standards and protocols for bank due diligence on third-party risk as they relate to banks partnering with fintech and regtech firms and using them as vendors. The agency would have to solve for how to address the risks in these kinds of relationships, while still making them readily possible.

> This strategy would require updating regulatory standards and protocols for bank due diligence on third-party risk as they relate to banks partnering with fintech and regtech firms and using them as vendors.

This would be an excellent topic for a tech sprint that could begin to create solutions.

Such an effort would also call for strategies to enable some digitally-native fintech firms to become banks, while holding to high standards of bank capacity to manage risks and serve customers.

These changes would enable fintech firms to scale up, would enable bank and credit union innovation to flourish beyond the realm of very large banks, and would inject first-rate technology into the banking system. It could jumpstart modernization throughout the system by enabling new technology to flow readily through it. The companies in the system would then have the capability to convert their systems to regtech.

Second: Launch an interagency "moonshot" project for rapid regtech transformation

> A regulator seeking an accelerated conversion could set up an interagency innovation task force to build a three-year 'moonshot' style initiative.

A regulator seeking an accelerated conversion could set up an interagency innovation task force to build a three-year "moonshot'' style initiative, with major scale and urgency, to enlist industry's help in co-creating the standards and the design framework needed for a digitally-native regtech system.

The effort could be officially sponsored by one agency if need be, but to be worthwhile, other agencies would have to participate actively.

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The project would need both public and private participation drawn from the regulatory, financial and technology spheres.

This initiative could use a Federally Funded Research and Development Center, or FFRDC, to facilitate both interagency work and leverage external sources of funding.

The project would take on the challenge of creating standards to make digital regulatory information interoperable. It would address the need for cloud computing, open source computer code, making regulation machine-readable and machine-executable, and shifting regulatory systems to a flexible platform architecture that enables "plug and play" and fosters continuous innovation. It would also establish or recommend a public/private governance structure for maintaining standards going forward.

CONCLUSION AND REQUEST FOR COMMENTS ON THE REGTECH MANIFESTO

Conclusion

By their nature, governments tend to change more slowly than do private entities, since the latter have fewer constraining rules and different structural and cultural complexities. In the financial world, many people assume that, even though technology will transform every other facet of modern life, the regulatory sector will be relatively untouched. People envision regulatory bodies gradually adopting new ways but not undergoing the fundamental redesign that pervades other realms.

This Manifesto argues, to the contrary, that the fundamental redesign is inevitable, and indeed, that it has already begun. Whether it will bring a better regulatory world will depend on the actions of legislators, regulators, industry and the regulatory community in the years just ahead.

It is sometimes said that the term "fintech" will become obsolete, because all financial services will be technology-based. The same may be true for regtech. The day may come when all regulatory work is enabled by digital technology. In that new reality, the regtech work of the human experts and the machines they use will again be called, simply, regulation. It is reasonable to hope that, in that new era, financial regulation will be more effective and efficient than has ever been possible before.

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Request for Comments

The Regtech Manifesto is offered as a Request for Comments. Drawing upon the initiatives and ideas of dozens of regulators and industry innovators throughout the world, the paper aims to engage a growing community in envisioning, designing and building a better system.

Please submit comments at regulationinnovation.org/regtech-manifesto/ or email hello@regulationinnovation.org.

With regard to the Manifesto as a whole, we ask for comments on these questions:

- Is there a compelling case for converting the system to digitally-native design? If so, what arguments are the most important? Which are least persuasive?

- What are the most promising use cases for a regtech-based system?

- What should a digitally-native regtech system look like? What should be its primary attributes and what principles should guide its development?

- What will be the main obstacles to progress, and how can they best be addressed?

- What will be the main risks and problems caused by adoption of regtech, and how should these be addressed?

- What kinds of entities should lead conversion to a new system and participate in building it? Are there valuable models to emulate regarding design and governance?

- What are the most practical strategies for converting to a digitally-native system, starting now and adopting change gradually over time?

APPENDICES

Appendix 1: Regtech Use Cases

Regtech is being adopted rapidly by both regulators and industry innovators worldwide. The following section highlights work that is underway.

Money Laundering -- Suspicious Activity Monitoring and Reporting

An important regtech application is monitoring and reporting of suspicious activity by money launderers and terrorist financing groups. Today, only 1% of illicit transactions are seized or frozen, in large part due to an analog reporting process in developed countries and lack thereof in developing countries.

Regtech can help automate the monitoring and reporting process, as well as coordination across organizations. This is especially important for financial crime, where international actors dominate illicit transactions, requiring interoperability and communication among law enforcement.

UK Financial Conduct Authority and AIR
The FCA has focused much of its regtech work on AML. In both 2018 and 2019 it held AML "Tech Sprints" -- hackathon-style events that convene regulatory and technology experts to work intensively and quickly in teams to produce potential solutions. The 2019 sprint was held in collaboration with AIR, which hosted a satellite site in Washington DC.

The FCA has enabled winners of its AML sprint competitions to move into various incubator environments and are in the process of implementing some of the resulting work.

The US Treasury Department has announced plans to convene a financial crime tech sprint in 2020.

United Nations goAML Project
The United Nations has been developing an AML tool for member countries to use within their financial intelligence units. The tool is software that can be accessed by UN member countries upon request. It can collect and clean data sets, conduct statistical and rules-based analysis, assign and track critical tasks, and generate intelligence reports. All components can be customized to local country requirements and regulatory infrastructure, but can also interface with national operational databases as well as international policing and coordinating bodies like INTERPOL, Europol and the Egmont Group.

The UN has already engaged 111 financial intelligence units globally, and 49 of them have deployed the goAML software in their local markets. The UN goAML Project continues to develop its software capabilities and will soon include applications for virtual and cryptocurrencies and the dark/deep web.

The goAML software helps financial intelligence units determine their country's financial sector maturity level compared to others, ranging from small units in fragile states to units that utilize big data to support a distributed user community or distributed financial institutions. The software also helps countries meet international financial intelligence standards and advance along the financial intelligence learning curve. By

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partnering with many international and regional institutions, it also promotes a uniform and global anti-money laundering platform.

Digital Identity

Many people in both the public and private sectors are working on digital identity projects. These extend beyond regtech uses but, as they develop, will enable regulators to tap into digitized information that will make their work easier and more effective.

Digital identity is widely seen as a potential solution for the regulatory issues surrounding the anti-money laundering Know Your Customer rules, or KYC. These require that customer identity be verified in order for people to enter the banking system. They have produced the inadvertent effect of screening out many consumers and small businesses from service, especially in emerging markets, where many people (and especially women) lack traditional identity papers.

In developed economies, meanwhile, there is growing recognition that analog-era identity information is no longer secure. Name, address, Social Security number and similar information is now widely for sale on the dark web. To secure identity verification systems, new measures will be needed that rely on biometrics and/or "attestations" reflecting the person's online activity.

As these tools emerge, regulators will incorporate them into their regtech strategies in areas like anti-money laundering and assuring fair financial access.

Machine-Readable Regulation / Digitizing the Rulebooks
Both regulators and private firms are working on regtech tools that attach electronic tags to sections of regulations. These enable machines to read rules and guidance, determine whether and how a given entity is covered and generate information on needed compliance.

Machine-Executable Regulation
The FCA and the Bank of England ran a 2017 tech sprint successfully testing whether they could issue some regulations in the form of computer code. The results are now being incubated to develop practical application in the agencies' Digital Regulatory Reporting project (see below).

Digital Regulatory Reporting
A promising example of machine-executable regulation evolved from the FCA's 2017 tech sprint and focuses on Digital Regulatory Reporting, or DRR. If implemented, this initiative will convert some spheres of FCA and Bank of England regulatory reporting to digitized forms. Under this system, the regulator would issue reporting requirements in the form of code which, when imported into a firm's systems, would make compliance automatic and instant.

The FCA has issued several papers on this initiative, is evaluating cost/benefit impacts and is running an ambitious DRR project.

Market Conduct Surveillance

The SEC, FINRA and a growing group of non-US regulators are using artificial intelligence for market surveillance aimed at detecting signs of misconduct in securities markets, such as anomalous broker behavior and potential insider trading.

Preventing "Phoenixing" and "Cockroaching"

Regulators are using digital technologies to detect situations in which people who have been banned from offering financial services set up new businesses under different names. These illegal activities are sometimes called "phoenixing," since the companies involved seem to die and come back to life. They are also sometimes termed "cockroach" situations, reflecting the difficulty of eliminating them.

Consumer Complaint Chatbots

With the help of the Regtech for Regulators Accelerator, or R2A, regulators in Manila and Mexico developed AI-based chatbots to receive consumer complaints via mobile phones. The tool can take in the complaint and analyze patterns to identify priorities needing regulatory attention. The system greatly extends the resources of understaffed regulators who could not process complaints on this scale using traditional methods. It also simplifies the complaint process for the consumer.

Appendix 2: Abbreviations and Agencies

AML: Anti-Money Laundering

BSA: Bank Secrecy Act

KYC: Know Your Customer

SAR: Suspicious Activity Report

AI: Artificial Intelligence

ML: Machine Learning

NLP: Natural Language Processing

DRR: Digital Regulatory Reporting

SDK: Software Development Kit

API: Application Programming Index

FinCEN: Financial Crimes Enforcement Network

FFIEC: Federal Financial Institutions Examination Council

SBA: Small Business Administration

FSOC: Financial Stability Oversight Council

OCC: Office of the Comptroller of the Currency

FDIC: Federal Deposit Insurance Corporation

CFTC: Commodity Futures Trading Commission

CFPB: Consumer Financial Protection Bureau

Appendix 3: Grateful Acknowledgement

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Appendix 4: Additional Resources

The following are resources on regtech and related technology:

Alliance for Innovative Regulation / AIR

AIR is a Washington DC-based nonprofit founded in 2019 to help catalyze and shape conversion of the financial regulatory system from analog to digital design. Our website maintains numerous resources and updates.

Publications

RegTech: Opportunities for More Efficient and Effective Regulatory Supervision and Compliance
The Global RegTech Industry Benchmark Report
Institute for International Finance, May 2019
An Urgent Call for KYC Optimization - A global market study calling for KYC innovation and collaboration
Financial Regulators' Dilemma: Administrative and Regulatory Hurdles to Innovation

Harvard Kennedy Working Paper Series
FinRegLab Reports on Use of Cash-Flow Data in Underwriting Credit
FinRegLab Reports on AI and Machine Learning in Financial Services
FinRegLab Reports on Building an Inclusive Recovery to the COVID-19 Pandemic

Podcasts

11:FS
a16z
Barefoot Innovation
Breaking Banks
Bank on It
Lend Academy
Masters of Scale: Open or Closed?
For Fintech's Sake
FinRegLab

US Regulatory Agencies

Commodity Futures Trading Commission (CFTC)
Consumer Financial Protection Bureau (CFPB)
Federal Deposit Insurance Corporation (FDIC)
Federal Reserve Board (FRB)
Financial Trade Commission (FTC)
Financial Industry Regulatory Authority (finra)
Office of the Comptroller of the Currency (OCC)
National Credit Union Association (NCUA)
Securities and Exchange Commission (SEC)
US Treasury

US State Regulators

CSBS
NY DFS
CA DBO
Arizona Sandbox

International Regulatory Agencies

Financial Conduct Authority of the United Kingdom
Bank of England
Monetary Authority of Singapore
Group of Twenty (G20)
Bank for International Settlements (BIS)

air

Organizations and International Bodies

RegTech Council (RTC)
International RegTech Association (IRTA)
RegTech for Regulators Accelerator (R^2A)
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World Bank
International Telecommunication Union (ITU)
United Nations Secretary-General's Special Advocate for Inclusive Finance for Development (UNSGSA)
Global Financial Innovation Network (GFIN)

Appendix 5: About Jo Ann Barefoot

Jo Ann Barefoot is CEO & Founder of AIR - the Alliance for Innovative Regulation, Cofounder of Hummingbird Regtech, and host of the podcast show Barefoot Innovation. A noted advocate of "regulation innovation," Jo Ann is Senior Fellow Emerita at the Harvard Kennedy School Center for Business & Government. She has been Deputy Comptroller of the Currency, partner at KPMG, Co-Chairman of Treliant Risk Advisors, and staff member at the U.S. Senate Banking Committee. She's an angel investor, serves on the board of Oportun, serves on the fintech advisory committee for FINRA, is a member of the Milken Institute U.S. FinTech Advisory Committee, and is a member of the California Blockchain Working Group Advisory Board. Jo Ann chairs the board of directors of FinRegLab, previously chaired the board of the Financial Health Network, and previously served on the CFPB's Consumer Advisory Board.