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RegTech: Opportunities for More Efficient and Effective Regulatory Supervision and Compliance

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TABLE OF CONTENTS

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EXECUTIVE SUMMARY

After the global financial crisis of 2008 awakened the world to the fact that financial innovation had far outpaced financial regulation, calls to re-regulate financial markets echoed around the world. In response to the crisis and subsequent wave of regulation, financial institutions and regulators have begun to look for ways to use emerging technologies to increase the efficiency and effectiveness of regulatory compliance and supervision. Regulatory technology, or RegTech, solutions have developed in the post-crisis years to meet this need. More specifically, the birth of RegTech has been characterized by the development of two distinct but complementary branches: compliance technology (CompTech) and supervisory technology (SupTech), used by financial institutions and financial regulators, respectively.

While some academics and industry experts have hailed RegTech as a "paradigm shift" for financial regulation, CompTech and SupTech are only just beginning to get significant attention from policymakers. In the United States, policymakers have taken some cautious steps to address RegTech within the context of their existing financial technology (FinTech) initiatives, but a handful of policymakers around the world have taken bolder steps to explore the opportunities of RegTech on its own terms.

In order to help guide policymakers in the U.S. in their approach to RegTech, the Milken Institute's Center for Financial Markets conducted independent research as well as interviews with 16 RegTech experts. To illustrate RegTech's path forward, we developed an analytical framework based on Edward Kane's work on financial regulation and our own conversations with RegTech experts. We found that CompTech will outpace SupTech in terms of speed of adoption, and the risk of trusting emerging technologies to execute key functions will limit the extent of RegTech's responsibilities in the near term.

EXECUTIVE SUMMARY

In light of these findings and our discussions with RegTech experts, the Institute developed the following recommendations for policymakers in the U.S. First, regulators should establish an Inter-Agency RegTech Task Force to coordinate engagement efforts and drive the conversation on how to enable RegTech solutions. Second, lawmakers should establish a RegTech Caucus to explore RegTech's potential to foster safer, more efficient financial markets.

BACKGROUND

Throughout his work in the 1970's and 1980's, Professor Edward Kane of Ohio State University developed a framework that describes a regulatory cycle between regulators and the regulated. Applied to financial services, Kane's regulatory cycle is characterized by a never-ending cycle of regulation, "regulation-induced innovation" by the regulated, and re-regulation, with financial institutions always one step ahead of their regulators.[1] The downsides of this cycle were laid bare for all to see during the global financial crisis of 2008. As the housing market collapsed it became clear that financial innovation had outpaced financial regulators, who were unable to adequately police financial markets with the tools at their disposal.

In response to the crisis, regulators were given a historic mandate to re-regulate financial markets to ensure that nothing of the kind could ever happen again. Globally, the number of regulatory changes in financial services has more than tripled since 2011, averaging 200 changes per day.[2] In the U.S., laws like the Dodd–Frank Wall Street Reform and Consumer Protection Act imposed a host of new requirements on financial institutions. This was particularly challenging for small financial institutions, for whom compliance costs are more onerous than their larger peers. According to the Federal Reserve Bank of St. Louis, compliance costs account for 8.7 percent of non-interest expenses at banks with less than $100 million in assets, compared to just 2.9 percent for banks with assets of $1 billion to $10 billion.[3]

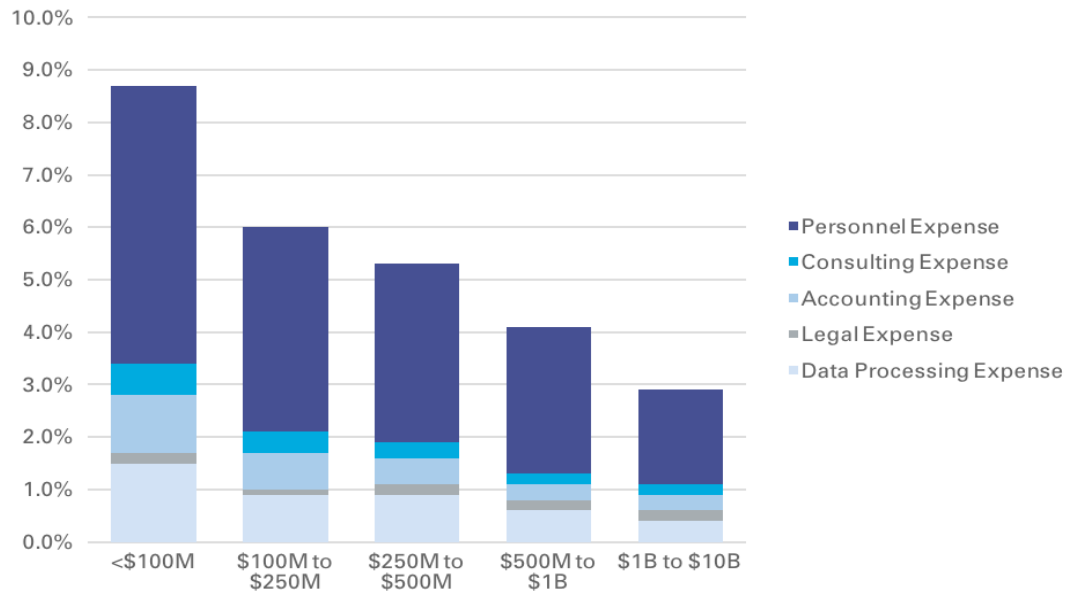
> "We think about things in terms of BC and AD. BC is 'Before the Crash', and AD is 'After Dodd-Frank'" **– Aron Miodownik, Cambrian Consulting**

[1] Kane, Edward J. 1981. "Accelerating Inflation, Technological Innovation, And The Decreasing Effectiveness Of Banking Regulation". The Journal Of Finance 36 (2): 355-367. doi:10.1111/j.1540-6261.1981.tb00449.x.

[2] Boston Consulting Group. 2017. "Staying The Course In Banking". Global Risk 2017. Boston Consulting Group. http://image-src.bcg.com/BCG_COM/BCG-Staying-the-Course-in-Banking-Mar-2017_tcm9-146794.pdf.

[3] Dahl, Drew, Andrew Meyer, and Michelle Neely. 2016. "Scale Matters: Community Banks And Compliance Costs". Federal Reserve Bank of St. Louis. https://www.stlouisfed.org/publications/regional-economist/july-2016/scale-matters-community-banks-and-compliance-costs.

Figure 1: Mean compliance expenses at financial institutions



Source: Dahl, Meyer and Neely 2016.

In keeping with the regulatory cycle, the post-crisis wave of regulation produced a countervailing wave of technological innovation to meet it. Financial institutions recognized that emerging technologies such as artificial intelligence (AI), cloud computing, and robotic process automation (RPA) can help address new regulatory requirements more efficiently and effectively than in the past. The application of these technologies to regulatory compliance has come to be called regulatory technology, or RegTech.

> We realized from our own experience that the weight of regulation was going to be a huge problem for the future of the industry, and so we wanted to be a part of something that could change that. **– Diana Parades, Suade**

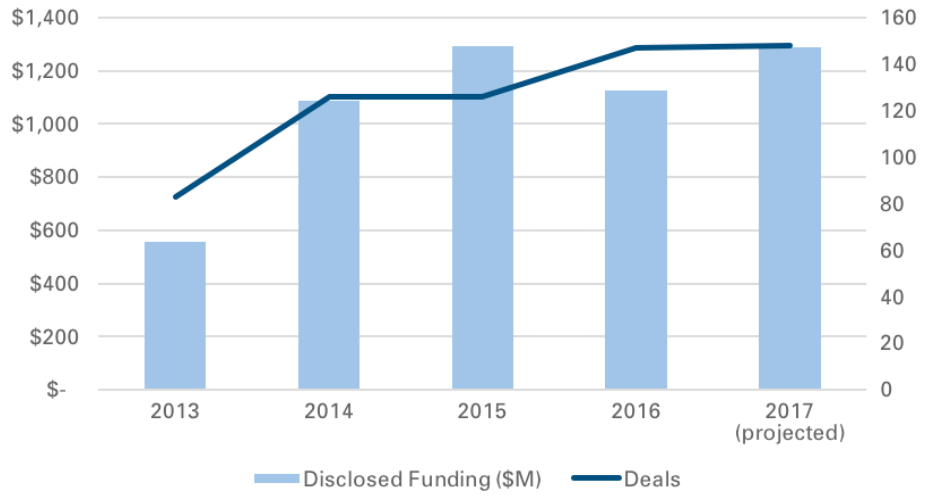
Yet, financial institutions need not be the only beneficiaries of technological innovation. Financial regulators have also taken notice of emerging technologies' potential to increase their supervisory capacity. Thus, we define RegTech as the use of emerging technologies by both *financial institutions* and *regulators* to manage *compliance* and *supervisory* challenges more efficiently and effectively.

While it is only one component of the FinTech revolution, RegTech has experienced steady growth in the wake of the financial crisis. Since 2013, RegTech has drawn $4.96 billion in equity funding across 585 deals.[4] According to Deloitte, there are currently over 240 RegTech companies globally, with the majority being in the U.S., the United Kingdom, and the European Union.[5] London boasts a particularly vibrant RegTech ecosystem, driven by its status as a tech capital, finance capital, and seat of government.

[4] Davis, Lindsay. 2017. "The State Of Regtech". CB Insights. https://www.cbinsights.com/research/briefing/state-of-regulatory-technology-regtech/.

[5] "Regtech Universe". 2018. Deloitte. https://www2.deloitte.com/lu/en/pages/technology/articles/regtech-companies-compliance.html.

Figure 2: RegTech annual equity funding



Source: Davis 2017.

COMPLIANCE TECHNOLOGY

To date, much of the discussion surrounding RegTech has exclusively focused on what we will call compliance technology, or CompTech. In the years immediately following the crisis, financial institutions simply hired more compliance officers and consultants to ensure that they were following the letter of the law.

CompTech: The use of the latest technology by firms to manage compliance challenges more efficiently and effectively.

This approach is unsustainable, however, particularly for small financial institutions. As financial institutions have slowly come to grips with the new reality, a critical assessment of their processes is leading them to invest in technological solutions that better address their compliance needs.

> "It's like a war where you need triage. Getting across rivers during the Allied forces' advance in Europe meant you had a lot of engineers building pontoon bridges just to get the basic tanks and munitions across, but eventually they had to be replaced with real bridges." – **Aron Miodownik, Cambrian Consulting**

SUPERVISORY TECHNOLOGY

RegTech is more than just CompTech. In March 2017, Ravi Menon, managing director of the Monetary Authority of Singapore (MAS), coined the phrase "supervisory technology," or SupTech.[6] In his address, Menon asked, "Why should regulated entities have a monopoly over the use of technology? Regulators too can harness technology to enhance the efficiency and effectiveness of supervision and surveillance."

> **SupTech**: The use of the latest technology by regulators to manage supervision challenges more efficiently and effectively.

As the regulatory cycle predicts, SupTech has not achieved the same level of investment or rapid adoption as CompTech. However, from a policymaker's perspective, its potential is far greater. Regulators such as Singapore's MAS and the U.S.' Securities and Exchange Commission (SEC) are already implementing SupTech solutions to complex supervisory challenges, such as monitoring investment advisor misconduct.[7]

DYNAMIC REGULATION

Ultimately, CompTech and SupTech are two sides of the same coin. Both financial institutions and regulators desire to maximize their efficiency and effectiveness, and see the latest technological advancements as valuable tools that can help them to do so.

[6] Menon, Ravi. 2017. "Financial Regulation – The Forward Agenda". Speech, Australian Securities and Investments Commission (ASIC) Annual Forum 2017, 2017.

[7] Bauguess, Scott W. 2017. "The Role Of Big Data, Machine Learning, And AI In Assessing Risks: A Regulatory Perspective". Speech, OpRisk North America 2017, 2017.

Further, many of the goals of regulators and financial institutions in this space are mutually held, such as streamlining the mechanisms for regulatory reporting. Lawrence Baxter, a professor at Duke Law School, believes that RegTech holds the promise to create a future of "dynamic regulation,"[8] in which regulators will have greater supervisory capacity than ever before and compliance departments at financial institutions will be able to ensure compliance in a cost-effective manner. Mutually beneficial use-cases for technology are at the core of the dynamic regulation vision of RegTech.

Some experts even believe that RegTech "should develop into a foundational base underpinning the entire financial services sector." Douglas Arner, Jànos Barberis, and Ross Buckley argue that RegTech may ultimately be larger and more impactful than FinTech due the potential to apply emerging technologies to regulations across multiple industries.[9] Indeed, they believe that RegTech signals a "paradigm shift that will necessitate a reconceptualization of financial regulation." To illustrate their point, the authors point to a 2014 speech by Andy Haldane, chief economist of the Bank of England, in which he stated:

> *I have a dream. It is futuristic, but realistic. It involves a Star Trek chair and a bank of monitors. It would involve tracking the global flow of funds in close to real time, in much the same way as happens with global weather systems and global internet traffic. Its centerpiece would be a global map of financial flows, charting spill-overs and correlations.*[10]

Four years on from those remarks, this "dream" is getting considerably closer to reality. Almost every expert interviewed by the Institute spoke of the need for regulators to move from traditional, analogue supervision to digital, real-time supervision.

[8] Baxter, Lawrence G. 2016. "Adaptive Financial Regulation And Regtech: A Concept Article On Realistic Protection For Victims Of Bank Failures". Duke Law Journal 66 (3): 567-604. https://scholarship.law.duke.edu/dlj/vol66/iss3/5/.

[9] Arner, Douglas W., Janos N. Barberis, and Ross P. Buckley. 2016. "Fintech, Regtech And The Reconceptualization Of Financial Regulation". Northwestern Journal Of International Law & Business, Forthcoming. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2847806.

[10] Haldane, Andrew G. 2014. "Managing Global Finance As A System". Speech, Maxwell Fry Annual Global Finance Lecture, Birmingham University, 2014.

REGTECH MODELS

Technology firms have been offering solutions to financial institutions and regulators for decades, but the emergence of advanced technologies and the increased weight of financial regulation have given rise to a new class of RegTech. To an extent, some of these firms resemble their FinTech cousins in that they are young startups using advanced technology to disrupt entrenched incumbents. However, RegTech is fundamentally different than FinTech in that it is exclusively a business-to-business, rather than business-to-consumer, industry (more on this below). As such, two models of RegTech firms have emerged in recent years.

Point Solutions

The first RegTech model is a firm that offers point solutions to specific problems faced by financial institutions or supervisors. Onfido, a Regtech startup based in the U.K., is one such example. Onfido addresses a specific pain point faced by many firms in the digital economy by using machine learning and biometrics to digitally verify identities. For example, Onfido works with digital bank Revolut to help them comply with their Know-Your-Customer (KYC) regulatory requirements by using facial recognition to securely verify that a user's photo identification document is, in fact, their own.[11]

Elliptic, another British RegTech startup, works with both law enforcement agencies and private firms to identify illicit activity on the Bitcoin blockchain. The firm uses a proprietary database that links Bitcoin addresses to "thousands of clear and dark web entities."[12] Through a partnership with LexisNexis Risk Solutions, Elliptic has also added anti-money laundering (AML) data into its database, allowing its clients to thoroughly screen Bitcoin addresses.[13]

[11] "Onfido Case Study: Revolut". 2017. Onfido.Com. https://hub.onfido.com/case-studies/revolut-case-study

[12] "About Elliptic". 2018. Elliptic. Co. https://www.elliptic.co/about.

[13] Macheel, Tanaya. 2016. "Lexisnexis, Elliptic Want To Make Bitcoin Safe For Banks". American Banker, , 2016. https://www.americanbanker.com/news/lexisnexis-elliptic-want-to-make-bitcoin-safe-for-banks.

> "You really need more of these spot solutions or point solutions be plug and play…I just had one of our big clients talking to me today…He said, 'I want more apps on my iPhone. I don't want people selling me the phone…Just get me the data and the model. Don't try to bring me the iPhone.'" – **PJ Di Giammarino, RegTech Council**

Enterprise Solutions

The second RegTech model is to offer flexible enterprise solutions that can be applied to a range of tasks. IBM, for example, offers a host of RegTech solutions through Watson Financial Services. In 2016, the firm bolstered its technological strength in AI by acquiring Promontory, a consulting firm specializing in risk management and regulatory compliance. This acquisition allows IBM to offer its clients an enterprise-wide, "360-degree view" of risk and compliance.[14]

Vizor, a RegTech firm based in Ireland, offers a SupTech enterprise solution that has been adopted by regulators in 27 countries, including the U.K., Canada, and New Zealand. In the U.K., for example, Vizor's technology is used by the Bank of England's Prudential Regulation Authority (PRA) to meet Solvency II data collection requirements.[15]

Among the experts interviewed by the Institute, there were diverging views on whether the future of RegTech lies in point or enterprise solutions. Some felt that it makes little sense for a large financial institution to incorporate a number of (potentially incompatible) point solutions into their compliance processes. Others took the opposing view, believing that point solutions that can be seamlessly incorporated into a financial institution's existing infrastructure "right out of the box" will continue to be well received.

[14] "Regtech And Cognitive Risk & Compliance | IBM". 2018. Ibm.Com. https://www.ibm.com/industries/banking-financial-markets/risk-compliance.

[15] "Bank Of England Prudential Regulation Authority Select Vizor". 2018. Vizor Software. https://vizorsoftware.com/bank-of-england-prudential-regulation-authority-select-vizor-software/.

EMERGING TECHNOLOGIES

Inevitably, there has been a great deal of hype surrounding the rise of AI, big data, cloud computing, and other emerging technologies. However, there have also been significant breakthroughs that should not be underestimated.

Klaus Schwab of the World Economic Forum believes we are living through the "fourth industrial revolution," distinct from those that preceded it due to the exponential speed of technological advancement.[16] MIT technologists Erik Brynjolfsson and Andrew McAfee call it the "second machine age," and compare AI to historic general purpose technologies, such as electricity and the internal combustion engine.[17] To be sure, the latest technologies are affecting every industry. At their core, RegTech, FinTech, InsurTech, AgTech, and HealthTech are the application of similar technologies to different industries still grappling with their use cases.

> "This technology is highly fungible, very easy to translate into other industries." – **Steve Smeltzer, Promontory Financial Group**

The following technologies are those that are most relevant for RegTech. Unless otherwise specified, we use the definitions developed by the Bank for International Settlements in their recent publication, "Sound Practices: Implications of fintech developments for banks and bank supervisors."[18]

[16] Schwab, Klaus. 2015. "The Fourth Industrial Revolution: What It Means, How To Respond". Foreign Affairs, , 2015. https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution.

[17] McAfee, Andrew, and Erik Brynjolfsson. 2017. "The Business Of Artificial Intelligence". Harvard Business Review, , 2017. https://hbr.org/cover-story/2017/07/the-business-of-artificial-intelligence

[18] Bank for International Settlements. 2018. "Sound Practices: Implications Of Fintech Developments For Banks And Bank Supervisors". Bank for International Settlements. https://www.bis.org/bcbs/publ/d431.pdf

Box 1: Emerging technologies

Big Data: Designates the large volume of data that can be generated, analyzed, and increasingly used by digital tools and information systems. This capability is driven by the increased availability of structured data, the ability to process unstructured data, increased data storage capabilities, and advances in computing power. While not a "technology" per se, big data is an enabling factor that is necessary for the latest technologies to achieve their full potential. This is especially true of AI and its machine learning sub discipline, which relies on massive volumes of data to refine its decision-making processes.

Artificial Intelligence (AI): IT systems that perform functions requiring human capabilities. AI can ask questions, discover and test hypotheses, and make decisions automatically based on advanced analytics operating on extensive data sets. The terms "machine learning," "deep learning," "cognitive computing," and "natural language processing" are often used as though they are separate from AI. In fact, all four of these technologies are sub-disciplines of AI.

Robotic Process Automation (RPA): RPA software performs routine business processes by mimicking the way that people interact with applications and by following simple rules to make decisions. RPA is the technology that accounts for much of the automation of rote tasks. The key difference between AI and RPA is that while AI has a certain ability to think for itself, RPA relies on pre-set rules applied to a specific task.[19]

Application Program Interfaces (APIs): A set of rules and specifications followed by software programs to communicate with each other, and an interface between different software programs that facilitates their interaction.

Cloud Computing: Refers to the use of an online network ("cloud") of hosting processors to increase the scale and flexibility of computing capacity. This model enables convenient on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage facilities, applications, and services) that can be rapidly released with minimal management effort or service provider interaction.

Biometrics: Provide a security mechanism used to identify, authenticate, and provide access to a facility or system based on the automatic and instant verification of an individual's physical characteristics, such as fingerprints, retina patterns, etc.

Distributed Ledger Technology (DLT): DLTs such as blockchain are a means of recording information through a distributed ledger, i.e. a repeated digital copy of data at multiple locations. These technologies enable nodes in a network to securely propose, validate, and record state changes (or updates) to a synchronized ledger that is distributed across the network's nodes.

[19] Deloitte. 2017. "Automate This: The Business Leader'S Guide To Robotic And Intelligent Automation". Deloitte. https://www2.deloitte.com/content/dam/Deloitte/us/Documents/process-and-operations/us-sdt-process-automation.pdf.

METHODOLOGY

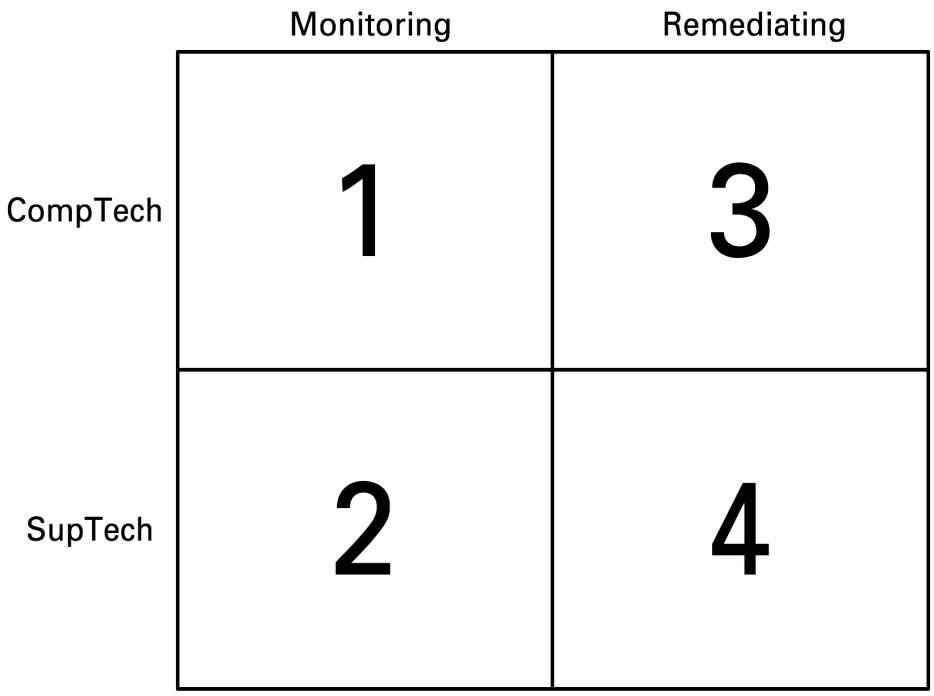
With RegTech attracting an increasing level of interest, the Milken Institute's Center for Financial Markets undertook an effort to gain a holistic understanding of the RegTech phenomenon. In order to inform its work, the Institute conducted interviews with 16 RegTech experts from a variety of backgrounds. Eight of these experts are in the RegTech industry themselves, offering both point and enterprise solutions to regulators and financial institutions. Four experts, who are engaged in the RegTech space, represent U.S. financial regulators, and the final four experts are leading RegTech consultants. Based upon these interviews, as well as the Institute's own research, this white paper provides an overview of RegTech, an analysis of RegTech's functions, a discussion of the actions that policymakers around the world are taking to enable RegTech, and recommendations for U.S. policymakers to take action in order to enable a safer financial system.

For the purposes of this white paper, we focus on the application of advanced technologies to regulatory supervision and compliance in the financial services sector. We limit our discussion to the use of emerging technologies (listed above in Box 1). This includes application program interfaces (API), AI, big data, biometrics, cloud computing, distributed ledger technology, and RPA. While this is not a comprehensive list of today's disruptive technologies, these are most relevant for RegTech. We must limit our discussion to the application of these technologies for financial regulation and compliance. Certainly, a broader discussion of regulatory use cases for these technologies across industries is warranted, but finance has emerged as an ideal proving ground for RegTech.

In order to better understand the regulatory cycle's impact on RegTech, we develop an analytical framework that differentiates between CompTech and SupTech as well as RegTech's two types of functions, "monitoring" and "remediating."

This framework illustrates that RegTech will be adopted according to Kane's regulatory cycle. That is, regulation will incentivize financial institutions to adopt CompTech innovations faster than financial regulators are able to adopt SupTech solutions. However, the regulatory cycle is not the sole factor shaping the future of RegTech. The risk of adopting RegTech increases as one moves along the spectrum from "monitoring" functions to "remediating" functions. Due to this increasing risk factor, most RegTech solutions are likely to stop one step short of automatically resolving a given issue, leaving the ultimate decision making power in the hands of the user.

Figure 3: The RegTech order of adoption



Source: Milken Institute.

ANALYSIS

The future of RegTech will be shaped by three main factors: (i) the regulatory cycle; (ii) the inherent risk of RegTech functions; (iii) institutional barriers to adopting new technologies.

REGULATORY CYCLE

There is always an "innovation lag" for both financial institutions and regulators to adopt emerging technologies, but the regulatory cycle ensures that this lag is shorter for financial institutions than their regulator. This is because regulation itself incentivizes financial institutions to adopt emerging technologies to improve their productivity in complying with (and, at times, avoiding) regulation. Conversely, the regulatory cycle ensures that technological innovation elongates regulators' "regulatory lag," whereby they are left to sort out the implications of technological innovation for regulation. In short, the regulatory cycle ensures that CompTech will outpace SupTech in terms of adoption.[20]

[20] Kane, Edward J. 1981. "Accelerating Inflation, Technological Innovation, And The Decreasing Effectiveness Of Banking Regulation". The Journal Of Finance 36 (2): 355-367. doi:10.1111/j.1540-6261.1981.tb00449.x.

RISK FACTOR OF REGTECH FUNCTIONS

However, the regulatory cycle is not the only factor that will shape the adoption of RegTech solutions. RegTech can be broadly thought of as performing two functions–monitoring and remediating. Most, if not all, RegTech solutions perform some type of monitoring function. For example, a financial institution may use AI to monitor financial transactions for AML or anti-terrorist financing purposes. Alternatively, they may use biometrics or distributed ledger technology to ensure compliance with KYC regulations.

Many RegTech solutions also perform a remediating function, whereby the technology takes a step towards either identifying or resolving an issue.

In most cases, this is as simple as flagging a suspicious transaction for a financial regulator to take a closer look at. However, technologies like AI have the capacity to go even further towards resolving an issue without human input by executing or blocking a transaction, for example.

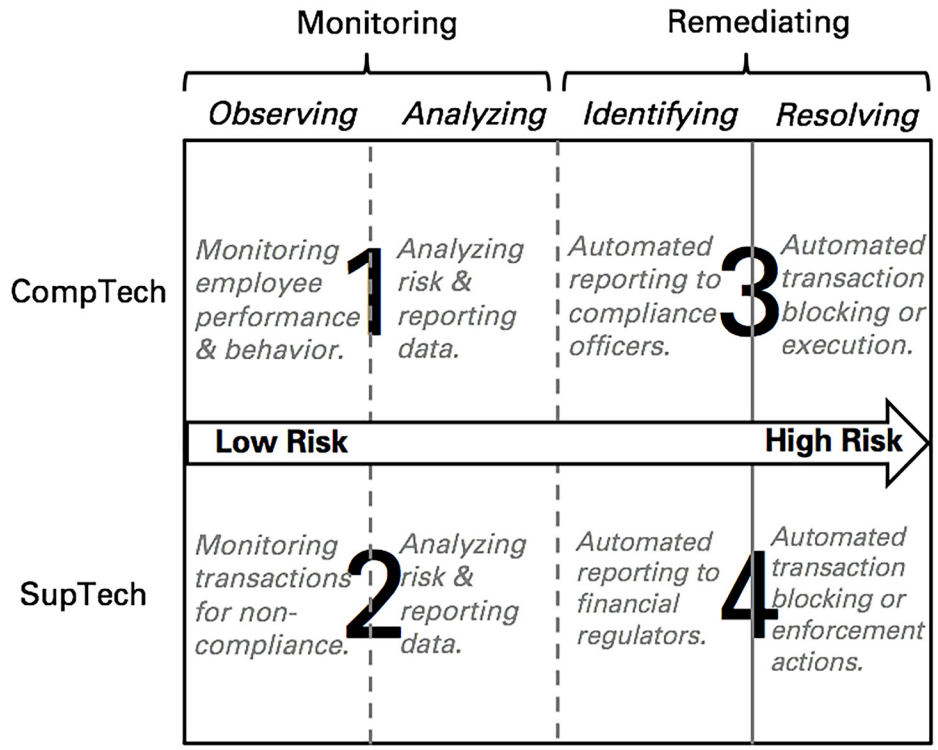
As one moves along the spectrum of RegTech functions from monitoring to remediating, the risk factor of trusting technology to perform a given function increases. There is relatively little risk, for example, in trusting an RPA solution to identify missing information in an internal report. The technology's ability to execute this type of function without error is well established. On the other hand, there is a great deal more risk in trusting an AI solution to make a correct judgment call when deciding whether to block a flagged financial transaction on behalf of a firm or regulator. Even if the technology's propensity to make mistakes is exceptionally rare, the stakes are much higher. An incorrectly blocked transaction could incur a substantial financial loss and raise difficult questions about liability.

This increasing risk factor of RegTech functions is the second factor that will shape the adoption of RegTech. Financial institutions and regulators will be more likely to adopt relatively low-risk monitoring solutions first, only moving towards higher-risk remediating solutions after they are fully comfortable with the underlying technology.

To better understand the increasing risk factor along the spectrum of RegTech functions, it is helpful to further break down each function. Monitoring can be broken into observing and analyzing, while remediating can be broken into identifying and resolving. Today, most RegTech solutions perform some type of observing, analyzing, and identifying functions. An AI RegTech solution may, for example, observe real time financial transactions, analyze their effect on a firm's risk, and identify the transactions that a manager should review more closely.

What most RegTech solutions do not do, however, is automatically resolve a transaction it has identified as problematic by blocking it, for example.

Figure 4: The RegTech Risk Spectrum



Source: Milken Institute.

Netflix, the popular entertainment platform, provides an illustrative non-finance example of these functions. Netflix uses AI to observe a user's movie watching preferences and analyze them based on others' preferences. Based on those observations and analysis, Netflix's technology is able to identify (suggest) other movies that one might like to watch. Of course, the risk factor is much lower for a technology that recommends movies than for one that recommends blocking a financial transaction, but the function is otherwise similar. In both cases, AI is used to observe real time events, analyze them based on previous knowledge, and identify a course of action for the user. What Netflix does not do is automatically play a movie that it believes a user might like when that user signs in to their account.

This allows the user to maintain control over the ultimate decision-making process, but allows him or her to be far more efficient and effective in their movie selection process.

In most cases, RegTech solutions are likely to follow this example and refrain from automatically resolving a case without input from the user.

> "In financial firms, decisions are made every day which require a judgment call. In most instances, the value of AI lies not in replacing the human decision maker, but in providing them with the tools to make better informed judgments and to operate more efficiently." – **Joanne Smith, Recordsure**

INSTITUTIONAL

As with all technological innovation, RegTech also faces a number of institutional and behavioral adoption challenges. First, RegTech's success depends on its ability to sell its solutions to financial institutions and government agencies. Despite the regulatory cycle's "regulation-induced innovation," neither financial institutions nor regulators are known for making fast decisions. Financial institutions tend to be large and unwieldy, and almost always have legacy IT systems that are expensive and time-consuming to update. Government agencies, meanwhile, must often go through lengthy procurement processes and may have limited control over their own budgets. Many of the experts interviewed by the Institute identified institutional resistance to change as an obstacle as well.

This long sales cycle creates a second financial challenge for young RegTech firms: finding patient, long-term oriented investors. For venture capitalists looking for quick returns, RegTech may not be the right investment.

> "I actually had an operator—who is going through three or four proof of concepts now with incumbents—tell me that he's not convinced that this is a venture backed asset class. In other words, the capital has to be so patient that it might not be suited to venture capital that is looking for quick returns…You are potentially talking about two years until you have a revenue-producing customer." – **Michael Meyer, MiddleGame Ventures**

As previously alluded to, the nature of emerging technologies themselves may also pose a challenge for RegTech innovation. Many of these technologies are relatively immature, and their integration into critical regulatory supervision and compliance functions is likely to be done very slowly until they have established a proven track record. Some emerging technologies are seen as being more mature than others. Regulators and financial institutions are becoming quite comfortable with RPA, for example, and AI is slowly moving into the mainstream. Most institutions are far less comfortable with DLT, however, and some have even begun to abandon their existing initiatives.[21]

> "People come to us and say, 'I'm trying to figure out my cognitive computing strategy.' Really, they have a hammer that's looking for a nail…To avoid that type of hype, you have to start with the problems that you're looking to solve." – **Scott Kohlhoff, Narrative Science**

Regulators and financial institutions are not alone in their guarded approach. Machine learning technology in particular has attracted a great deal of public attention, and no shortage of criticism. Because machine learning involves algorithms that "teach themselves," many worry that the decisions they make will be unexplainable to human beings.[22] Even strong proponents of machine learning technology acknowledge these "black-boxes." Some even acknowledge the possibility that like the decision-making processes of human beings, we may never fully understand why certain machine learning algorithms make a given decision. In light of this, a consensus is emerging among policymakers that until machine learning's decision making processes are better understood, the technology may have to be limited to that which is explainable.[23]

Despite these challenges, forward thinking policymakers around the world have begun to engage with RegTech in a variety of ways. This engagement is critical for RegTech, as regulators are both a producer and a consumer of RegTech solutions.

[21] Irrera, Anna, and John McCrank. 2018. "Wall Street Rethinks Blockchain Projects As Euphoria Meets Reality". Reuters, , 2018. https://www.reuters.com/article/us-banks-fintech-blockchain/wall-street-rethinks-blockchain-projects-as-euphoria-meets-reality-idUSKBN1H32GO.

[22] Knight, Will. 2017. "The Dark Secret At The Heart Of AI". MIT Technology Review, 2017. https://www.technologyreview.com/s/604087/the-dark-secret-at-the-heart-of-ai/.

[23] The Economist. 2018. "AI In Society: For Artificial Intelligence To Thrive, It Must Explain Itself", 2018. https://www.economist.com/news/science-and-technology/21737018-if-it-cannot-who-will-trust-it-artificial-intelligence-thrive-it-must.

REGTECH POLICY INITIATIVES

Policymakers around the world have begun to implement institutional responses to RegTech. These vary from initiatives to support the adoption of CompTech solutions by financial institutions to the internal adoption of SupTech solutions. In some cases, these responses to RegTech have come as an addition to their newly established institutional responses to FinTech, with office hours and regulatory sandboxes being the clearest examples of this. Sandboxes are regulator-run programs under which firms are allowed to "test innovative products, services or business models in a live market environment, while ensuring that appropriate protections are in place."[24] The sandbox approach was established by regulators hoping to create an enabling environment for FinTech, but they have allowed many RegTech innovators to operate in their sandboxes as well.[25] This section details several initiatives established by policymakers to address RegTech, as well as two initiatives led by the private sector.

INTERNATIONAL INITIATIVES

Finacial Conduct Authority (FCA)

The U.K.'s FCA has led the response to RegTech among international regulators. In November 2015, the FCA issued a call for input on the development and adoption of RegTech, which asked for guidance on the FCA's role in facilitating RegTech's development, as well as for broader input on the nature of RegTech itself.[26] Broadly, respondents agreed on the need for an engaged regulator to play a part in the development of RegTech, and that the development of RegTech will require regulatory clarification and standardization. Ideally, this would include defining new regulations in machine-readable format.

[24] Financial Conduct Authority. 2017. "Regulatory Sandbox Lessons Learned Report". Financial Conduct Authority. https://www.fca.org.uk/publication/research-and-data/regulatory-sandbox-lessons-learned-report.pdf.

[25] Transatlantic Policy Working Group. 2016. "The Future Of Regtech For Regulators". Innovate Finance. https://www.innovatefinance.com/wp-content/uploads/2017/06/tpwg-regtech-paper-digital.pdf.

[26] Financial Conduct Authority. 2015. "Call For Input: Supporting The Development And Adoption Of Regtech". Financial Conduct Authority. https://www.fca.org.uk/publication/call-for-input/regtech-call-for-input.pdf

Respondents to the FCA's call for input mentioned that there was particular room for improvement in regulatory reporting. Since the financial crisis, the reporting burden has greatly increased for financial institutions, and regulators are often forced to make ad hoc requests for additional information. In order to simplify this process, the FCA held a "TechSprint" in cooperation with the Prudential Regulation Authority (PRA) at the Bank of England. This event created a proof of concept to show that turning regulations into machine-readable format is indeed possible.

The TechSprint also successfully showed that a machine was able to execute based on the machine-readable rule, and even successfully simulated a regulatory rule change, whereby a change in the machine-readable regulation resulted in a correct modification of the information being reported. Having successfully demonstrated this, the FCA issued a new call for input in February 2018 seeking opinions on the best approach to take next steps, as well as on the implications of machine-executable reporting.[27]

This TechSprint represents the cutting edge of regulator involvement in the RegTech space. Even so, the FCA is still very much in the early days of their engagement in the RegTech space. As the FCA correctly states in their 2016 feedback statement, there are limitations to the role that they, or any one regulator can play in the development of RegTech.

Continuing the work that they started will require international coordination between regulators and industry with significant public input into the process.

[27] Financial Conduct Authority. 2018. "Call For Input: Using Technology To Achieve Smarter Regulatory Reporting". Financial Conduct Authority. https://www.fca.org.uk/publication/call-for-input/call-for-input-smarter-regulatory-reporting.pdf

Monetary Authority of Singapore (MAS)

As previously discussed, MAS has been a leading voice in the development of SupTech as a concept distinct from what we call CompTech (MAS simply refers to CompTech as RegTech). In 2017, MAS formed the Data Analytics Group, which includes a Supervisory Technology Office as one of its three units. The SupTech Office will "conduct data analysis on supervisory and financial sector data in partnership with MAS departments. It also works with the Fintech and Innovation Group to promote data analytics capabilities within the financial industry and foster innovations to make regulatory compliance more efficient and effective."[28]

However, the MAS SupTech Office is not solely limited to SupTech, as its name might imply. If CompTech and SupTech are two sides of the same coin, MAS Chief Data Officer Dr. David Hardoon explained the SupTech Office's approach as being "the coin." That is, the office has a dual remit of promoting data capabilities within financial institutions to make compliance more efficient and effective, and to work with supervisors to leverage data analysis to improve their supervision capacity.[29]

Ravi Menon, managing director of MAS, notes that MAS is working on SupTech solutions to improve its screening of suspicious transaction reports (STRs) and its ability to detect syndicated activities.[30] More work remains to be done, however. Menon believes that in the future, RegTech will be applying predictive algorithms for stress testing and behavioral algorithms to monitor trading.[31]

U.S. INITIATIVES

The U.S.' fragmented regulatory environment has proven to be a significant obstacle to a cohesive national FinTech strategy, with some regulators taking a more proactive role than others in addressing the FinTech space. Thus far, the same appears to be true for RegTech. What is different, however, is that some regulators, such as the SEC, have been engaged in the SupTech space themselves for quite a long time.

[28] Monetary Authority of Singapore. 2017. "MAS Sets Up Data Analytics Group". http://www.mas.gov.sg/News-and-Publications/Media-Releases/2017/MAS-Sets-up-Data-Analytics-Group.aspx.

[29] Hardoon, David. 2017. "Data Science And Machine Learning In Practice". Speech, 7th Annual Sim Kee Boon Institute Conference on Advances in Data Science and Implications for Business, 2017

[30] Menon, Ravi. 2017. "Financial Regulation – The Forward Agenda". Speech, Australian Securities and Investments Commission (ASIC) Annual Forum 2017, 2017.

[31] Menon, Ravi. 2017. "Financial Regulation: The Way Forward". Speech, OMFIF City Lecture, at The Arts Club, Washington D.C., 2017.

Securities and Exchange Commission (SEC)

While the SEC does not have an FCA or MAS-like RegTech initiative, it has been a quiet SupTech pioneer for some time. At the 2018 RegTech Data Summit, SEC Commissioner Michael Piwowar highlighted the SEC's efforts and discussed some of the SEC's SupTech initiatives that may not make headlines, but that have become crucial to the supervision of modern financial markets.

- Advanced Relational Trading Enforcement Metric Investigation System (ARTEMIS): "ARTEMIS analyzes patterns and relationships among multiple traders using the Division's electronic database of over six billion electronic equities and options trading records to identify and assess suspicious trading."[32]

- Market Information Data Analytics System (MIDAS): "MIDAS collects about 1 billion records per day from the proprietary feeds of each of the 13 national equity exchanges time-stamped to the microsecond. MIDAS allows the SEC to readily perform analyses of thousands of stocks and over periods of six months or even a year, involving 100 billion records at a time."[33]

Further, the SEC has taken significant steps to aggregate and standardize financial data to both improve its supervisory capacity and facilitate regulatory reporting for financial institutions. The SEC's decision in 2017 to propose a rule requiring the use of Inline eXtensible Business Reporting Language (XBRL) in regulatory filings would go a long way towards standardizing our disclosure system,[34] while the development of the Consolidated Audit Trail in cooperation with the Financial Industry Regulatory Authority would allow regulators to track all of the US activity in National Market System securities.[35]

[32] White, Mary Jo. 2016. "Remarks At The International Institute For Securities Market Growth And Development". Speech, International Institute for Securities Market Growth and Development, , 2016.

[33] "Market Structure | Market Information Data Analytics System". 2018. Sec.Gov. https://www.sec.gov/marketstructure/midas.html#.Wvn8q4gvw2x.

[34] Stein, Kara M. 2017. "Statement On The Commission'S Proposal For Inline XBRL Filing Of Tagged Data". Speech, 2017.

[35] "SEC.Gov | Rule 613 (Consolidated Audit Trail)". 2018. Sec.Gov. https://www.sec.gov/divisions/marketreg/rule613-info.htm

Commodity Futures Trading Commission (CFTC)

The CFTC launched LabCFTC in May 2017. The initiative aims to promote responsible FinTech innovation and "to accelerate CFTC engagement with FinTech and RegTech solutions that may enable the CFTC to carry out its mission responsibilities more effectively and efficiently."[36] As such, LabCFTC's mission is the most explicit in its interest in the RegTech space. The CFTC's "CFTC 2.0" initiative is particularly important to LabCFTC, and highlights the CFTC's intent to use the latest technology to carry out its mission.[37] However, these initiatives are still in their early stages.

Consumer Financial Protection Bureau (CFPB)

The CFPB's Project Catalyst was launched in 2012 to encourage consumer-friendly financial innovation, and was renamed to the Office of Innovation in 2018.[38] Project Catalyst established an open dialogue with innovators to ensure that they are engaged in the FinTech space. With respect to RegTech, the CFPB has already been using SupTech solutions for some time on their consumer response team.[39]

> "Our consumer response team has been using natural language processing in their work for some time. That has produced a lot of interesting insights for us. It helps our enforcement office look for areas they need to focus on … I think this is an example of the technology that the CFPB has been using to work smarter and to help us more efficiently and effectively allocate our resources." – **Dan Quan, CFPB**

Office of the Comptroller of the Currency (OCC)

The OCC's approach to engaging with FinTech is different than that of other regulators, in that it does not explicitly name or define the sectors in which it is looking for innovation. Rather, the OCC's focus is on "responsible innovation," which it defines as "the use of new or improved financial products, services, and processes to meet the evolving needs of consumers, businesses, and communities in a manner that is consistent with sound risk management and is aligned with the bank's overall business strategy."[40]

[36] "Labcftc Overview | U.S. Commodity Futures Trading Commission". 2018. Cftc.Gov. https://www.cftc.gov/LabCFTC/Overview/index.htm.

[37] Ibid.

[38] Beyoud, Lydia. 2018. "CFPB Fintech Group Poised For Renaissance After Restructuring". Bna.Com. https://www.bna.com/cfpb-fintech-group-n73014476056/.

[39] "Project Catalyst | Consumer Financial Protection Bureau". 2018. Consumer Financial Protection Bureau. https://www.consumerfinance.gov/about-us/project-catalyst/.

[40] "OCC: Responsible Innovation". 2018. Occ.Treas.Gov. https://www.occ.treas.gov/topics/responsible-innovation/index-innovation.html.

To that end, the OCC's Office of Innovation was founded in October 2016 to support responsible innovation in finance and establish an open dialogue with innovators in finance.[41]

The Financial Transparency Act

The Financial Transparency Act (H.R. 1530) was originally introduced in 2015 by Representative Darrell Issa (R, CA). The bill would direct the SEC, CFTC, OCC, CFPB, Federal Reserve, Federal Deposit Insurance Corporation, Federal Housing Finance Agency, and the National Credit Union Administration to adopt consistent data standards for regulatory reporting under securities, commodities, and banking laws. Wherever this information is required to be made public, the law directs these agencies to make it available online as open data.[42]

The bill has bipartisan support, and has emerged as a top priority for the Data Coalition, a trade association that advocates for open, machine-readable government data. According to the Data Coalition, the Financial Transparency Act is needed because:

> *"Most U.S. financial regulators do not use data standards to organize the information they collect from regulated entities. Regulators use inconsistent identifier codes for entities, instruments, and transactions. Too many financial regulatory filings are still collected as documents—paper, PDF files, plain-text HTML—instead of using structured data formats like XML and XBRL…This is a problem because when regulators collect and disclose information in, say, the ubiquitous Portable Document Format (PDF), they create substantially more work for those who want to use it—investors, markets, tech companies, and even the regulators' own staff."*[43]

[41] Office of the Comptroller of the Currency. 2016. "Supporting Responsible Innovation In The Federal Banking System: An OCC Perspective". Office of the Comptroller of the Currency. https://www.occ.treas.gov/publications/publications-by-type/other-publications-reports/pub-responsible-innovation-banking-system-occ-perspective.pdf.

[42] "H.R.1530 - 115Th Congress (2017-2018): Financial Transparency Act Of 2017". 2018. Congress.Gov. https://www.congress.gov/bill/115th-congress/house-bill/1530?q=%7B%22search%22%3A%5B%22financial+transparency+act%22%5D%7D&r=1.

[43] "The Financial Transparency Act". 2018. Data Coalition. https://www.datacoalition.org/issues/financial-transparency-act/.

PRIVATE SECTOR INITIATIVES

RegTech for Regulators Accelerator

The RegTech for Regulators Accelerator, or R²A, was launched in October 2016 to work with financial regulators to develop "the next generation of tools and techniques for market supervision and policy analysis." The program, sponsored by the Bill & Melina Gates Foundation, Omidyar Network, USAID, BFA, and Rockefeller Philanthropy Advisors; holds competitions for private sector firms to develop SupTech solutions for financial regulators. R²A has partnered with the Bangko Sentral ng Pilipinas from the Philippines, the Bank of Ghana, and the Comisión Nacional Bancaria y de Valores of Mexico to develop these solutions.[44]

Currently, the accelerator is in the testing phase on two projects. Compliant Risk Technology LLC & Pinecone Ltd. won an award to develop an API for regulatory reporting in the Philippines, while Gestell Heuristics won an award to develop a platform for AML supervision in Mexico. R²A is also holding a competition to develop a customer complaint chatbot for the Bangko Sentral ng Pilipinas, which is still accepting submissions.[45]

RegTech Associations

Outside of policymakers' efforts to encourage the development of RegTech, several private-sector led initiatives have formed to guide RegTech's growth and encourage collaboration in the space.

- The International RegTech Association (IRTA): The IRTA's mission is to ease and accelerate the evolution of the RegTech industry, by facilitating integration, collaboration and innovation of all stakeholders, within the Financial Services sector.[46]

[44] "What Is R2A". 2018. Regtech For Regulators Accelerator. https://www.r2accelerator.org/about-r2a/.

[45] "R2A Competitions". 2018. Regtech For Regulators Accelerator. https://www.r2accelerator.org/competitions/.

[46] Regtechassociation.org. (2018). IRTA - International RegTech Association. [online] Available at: https://regtechassociation.org/.

- The RegTech Council: The RegTech Council creates a strategic dialogue to focus practical regulatory reform implementation efforts. This includes setting the collaborative agenda for RegTech (i.e., how to align implementation efforts across regulations), curating the common artefacts (e.g. code base, data models, etc.), and stimulating the supply chain to be ready when regulators need them to be and banks want to de-risk implementation programs.[47]

[47] "Regtech Council | Regtechfs". 2018. Regtechfs.Com. https://regtechfs.com/regtech-council/.

POLICY RECOMMENDATIONS

During the course of our interviews, the Institute asked for each expert's view on what is needed for RegTech to reach its full potential. Two common themes emerged. First, experts interviewed by the Institute feel that an engaged regulator is absolutely critical in the RegTech space. Second, experts agreed that data standardization is the most important technical consideration for RegTech to meet its full potential. The futuristic vision of "dynamic regulation" foreseen by some academics and regulators presupposes a level of standardization that, at present, the U.S. is far from achieving.

In light of these considerations and findings from our own research, the creation of an Inter-Agency RegTech Task Force among U.S. regulators and a RegTech Caucus in Congress would be appropriate first steps to enable the application of RegTech to foster safer financial markets in the U.S. In taking both of these steps, policymakers should keep CompTech's natural first-mover advantage over SupTech in mind, and give special attention to ensuring that financial regulators are able to quickly adopt the latest technologies.

INTER-AGENCY REGTECH TASK FORCE

As outlined above, several regulators in the U.S. have taken a proactive approach to engagement with RegTech (and FinTech) firms. This is encouraging, and the Institute believes that these initiatives should be prioritized within their agencies and receive full budgetary support from legislators. However, the fragmented nature of financial regulation in the U.S. necessitates a more ambitious approach. The Institute recommends that the Department of the Treasury create an interagency RegTech Task Force to coordinate engagement efforts and drive the conversation around enabling RegTech innovation.

Specifically, the RegTech Task Force should have three responsibilities: leading agency engagement efforts, coordinating efforts to standardize regulatory reporting requirements and data formats, and directing initiatives that drive the adoption of SupTech solutions. The RegTech Task Force should consist of the following:

The Federal Reserve	The Office of the Comptroller of the Currency
The Department of the Treasury	The Federal Deposit Insurance Corporation
The Department of Commerce	The Federal Trade Commission
The Consumer Financial Protection Bureau	The Federal Housing Finance Agency
The Commodity Futures Trading Commission	The National Credit Union Administration
The Securities and Exchange Commission	The Office of Financial Research

To lead agency engagement on RegTech, the RegTech Task Force should:

1. **Ensure that all member agencies have office hours in place for RegTech firms to discuss their business with regulators.** The RegTech Task Force should also hold an annual convening where representatives from each agency can discuss the input they have received during office hours over the previous year. Following this convening, the task force should produce a document that details actions each of the agencies will take in response to feedback from office hours.

2. **Designate a Data Standardization Working Group that consists of the relevant experts from each agency to coordinate efforts to standardize regulatory reporting requirements and data formats.** This working group should first conduct a study that identifies specific areas where agencies can standardize their regulatory reporting requirements, data formats, or other rules and processes that have been identified as a barrier to RegTech.

Second, the working group should set actionable goals and convene on a regular basis to track progress in these areas. Throughout this process, the working group should consider the effect of their work on international standards. Technical Committee 68 of the International Organization for Standardization assisted the European Commission in a similar effort and could play a valuable advisory role to the Data Standardization Working Group.

3. **Look to the examples set by the U.K.'s FCA and the R²A Accelerator to drive the adoption of SupTech solutions**. This means leveraging the resources of both the public and private sector to create incentives to develop SupTech solutions. The RegTech Task Force should develop a strategic plan to host internal competitions such as the FCA's TechSprint as well as projects that incentivize private sector innovators to develop SupTech solutions.

REGTECH CAUCUS

While FinTech has received a great deal of attention from lawmakers over the past several years, RegTech has yet to gain a similar level of recognition. One factor that has helped to drive FinTech action by lawmakers is the nine caucuses that are either focused on or relevant to FinTech. The Congressional FinTech and Payments Caucus, for example, has been one of the most active in facilitating a FinTech dialogue, and its members have been leaders in producing the necessary legislation to enable FinTech's growth in the U.S. As shown in the Institute's recent analysis, a great deal of bipartisan FinTech legislation has been introduced over the past two Congresses, much of which has a great deal of momentum going forward.[48]

Many of the same caucuses are also relevant to RegTech, but RegTech does not have its own caucus. The Institute therefore recommends that lawmakers create a RegTech Caucus to take the lead on advocating for RegTech solutions that make regulatory compliance more manageable and regulatory supervision more effective.

[48] Mueller, Jackson. 2018. "Bipartisan Opportunities To Legislate U.S. Fintech In The 21St Century". The Milken Institute. https://assets1b.milkeninstitute.org/assets/Publication/Viewpoint/PDF/FINAL-FinTech-Bipartisan-Legislation2.pdf

POLICY RECOMMENDATIONS

Too often in Washington, the political debate is hung up on whether more or less regulation is needed. RegTech can be a non-partisan antidote to this impasse, as both sides should be able to agree that improved enforcement mechanisms and more efficient compliance procedures are warranted. To that end, the RegTech caucus should focus on the applications of RegTech for areas that are of importance to lawmakers on both sides of the aisle. For example, a focus on RegTech's potential for small financial institutions, whose increased compliance costs have limited their ability to lend, would likely generate bipartisan interest.

CONCLUSION

During the global financial crisis, it became clear that financial regulation is no match for the speed of financial innovation due to the regulatory cycle. The development of RegTech must be understood as a part of that same process with the emergence of CompTech coming in response to the latest wave of re-regulation. CompTech has already outpaced SupTech in terms of adoption, and will likely continue to do so as financial institutions gain an understanding of the benefits of applying emerging technologies to their compliance challenges. However, RegTech also represents a unique opportunity to capitalize on the mutually shared goals of financial institutions and their regulators to foster safer, more efficient financial markets.

Due to the risks of applying relatively immature technologies to systemically important functions, the adoption of RegTech is sure to be characterized by a cautious approach. This is a good thing, and care should be taken to ensure that the risks of applying a RegTech solution have been fully considered. For now, it is likely that only the most thoroughly tested emerging technologies will be allowed to play a "resolving" role in key compliance and supervisory functions.

However, policymakers should nevertheless encourage the development of and experimentation with RegTech solutions. Already, forward thinking policymakers around the world are taking action to explore RegTech's potential to address longstanding compliance and supervisory challenges. The FCA's TechSprint, for example, is a promising model that encourages regulators and innovators to come together to advance the latest technologies in a way that benefits both parties, as well as the larger public.

CONCLUSION

In order to guide policymakers in the U.S. in their approach to RegTech, the Institute developed two policy recommendations to help RegTech meet its full potential in the U.S.

First, regulators should establish an Inter-Agency RegTech Task Force to coordinate engagement efforts and drive the conversation on how to enable RegTech solutions. Specifically, this task force should work to institutionalize office hours at the relevant regulatory agencies, create a working group to address the challenge of data standardization, and adopt an approach similar to that taken by the FCA and R^2A Accelerator to encourage the development of SupTech.

Second, lawmakers should establish a RegTech Caucus to explore RegTech's potential. In a time when the conversation about whether financial markets should be more or less regulated too often ends in an impasse, RegTech provides a unique opportunity to make financial markets safer without igniting partisan differences.

ABOUT US

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ABOUT US

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