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FinTech, RegTech, and the Reconceptualization of Financial Regulation

*Douglas W. Arner**, *János Barberis*** & *Ross P. Buckley****

Abstract: Regulatory change and technological developments following the 2008 Global Financial Crisis are changing the nature of financial markets, services, and institutions. At the juncture of these phenomena lies regulatory technology or “RegTech”—the use of technology, particularly information technology, in the context of regulatory monitoring, reporting, and compliance.

Regulating rapidly transforming financial systems requires increasing the use of and reliance on RegTech. Whilst the principal regulatory objectives (e.g., financial stability, prudential safety and soundness, consumer protection and market integrity, and market competition and development) remain, their means of application are increasingly inadequate. RegTech developments are leading towards a paradigm shift necessitating the reconceptualization of financial regulation.

RegTech to date has focused on the digitization of manual reporting and compliance processes. This offers tremendous cost savings to the financial services industry and regulators. However, the potential of RegTech is far greater – it has the potential to enable a nearly real-time and proportionate regulatory regime that identifies and addresses risk while facilitating more efficient regulatory compliance.

We argue that the transformative nature of technology will only be captured by a new approach at the nexus of data, digital identity, and regulation. This paper seeks to expose the inadequacy of digitizing analogue processes in a digital financial world, sets the foundation for a practical understanding of RegTech, and proposes sequenced reforms that could benefit regulators, industry, and entrepreneurs in the financial sector and other industries.

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I. INTRODUCTION

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 (from a Star Trek chair using a bank of monitors), 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.¹

-Andy Haldane, Chief Economist, Bank of England (2014)

Regulatory and technological developments are changing the nature of financial markets, services, and institutions in ways completely unexpected prior to the 2008 Global Financial Crisis (GFC), which we have addressed in previous work.² “FinTech” refers to the use of technology to deliver financial solutions and is one aspect of these fundamental changes. The rapid evolution and development of FinTech demands a similar evolution and development of “RegTech.”³ RegTech is a contraction of the terms *regulatory* and *technology*, and it comprises the use of technology, particularly information technology (IT), in the context of regulatory monitoring, reporting, and compliance. In the words of Christophe Chazot, HSBC Group Head of Innovation, RegTech can be described as “technological solutions to regulatory processes.”⁴ The automation of processes allows for better and more efficient risk identification and regulatory compliance than that which currently exists.⁵ The recent deal by which IBM is to acquire Promontory Financial Group heralds the way forward. The synergies in the deal come from the 600 risk and compliance consultants within Promontory teaching Watson, IBM’s huge artificial intelligence system, how to apply AI to risk management and compliance obligations.⁶

¹ Andy Haldane, Chief Economist, Bank of Eng., Speech at the Maxwell Fry Annual Global Finance Lecture: Managing Global Finance as a System, Birmingham University 10 (Oct. 29, 2014) (transcript available online on the Bank of England website).

² See Douglas W. Arner, Janos Barberis & Ross P. Buckley, *The Evolution of FinTech: A New Post-Crisis Paradigm?*, 47 GEORGETOWN J. INT’L L. 1271, 1272-1319 (2016); ROSS P. BUCKLEY & DOUGLAS W. ARNER, FROM CRISIS TO CRISIS: THE GLOBAL FINANCIAL SYSTEM AND REGULATORY FAILURE (2011).

³ See *infra* Part C.III of this article; see also INST. OF INT’L FIN., REGTECH IN FINANCIAL SERVICES: TECHNOLOGY SOLUTIONS FOR COMPLIANCE AND REPORTING 5-8 (March 2016).

⁴ INST. OF INT’L FIN., REGTECH: EXPLORING SOLUTIONS FOR REGULATORY CHALLENGES 2 (Oct. 2015).

⁵ See SANTIAGO FERNANDEZ DE LIS, ET AL., REGTECH, THE NEW MAGIC WORD IN FINTECH 1 (March 2016).

⁶ Penny Crossman, *IBM Buying Promontory Clinches It: Regtech is Real*, AMERICAN BANKER (Sept. 29, 2016, 4:42 PM), <https://www.americanbanker.com/news/ibm-buying-promontory-clinches-it-regtech-is-real>.

Our vision builds on that of Andy Haldane, whereby financial institutions and regulators monitor and analyze real-time financial information from all parts of the global financial sector to underpin a safer and more efficient financial system.⁷

Of late, two painful pressure points have come to bear on the financial services industry and support our vision. On the expense side, postcrisis fines have exceeded US\$200 billion,⁸ and the ongoing cost of regulation and compliance has become a primary concern industry-wide.⁹ On the revenue side, competition from FinTech companies is expected to put US\$4.7 trillion of revenues at risk.¹⁰ These expense and revenue factors are driving the development of RegTech. As with FinTech,¹¹ the 2008 GFC represented a turning point in the development of RegTech.¹² However, the factors underlying, and the beneficiaries of, RegTech are quite different. FinTech growth has been led by start-ups (now increasingly partnering with, or being acquired by, banks and other traditional financial institutions),¹³ whilst RegTech developments to date are primarily a response to the huge costs of complying with new institutional demands by regulators and policy makers.¹⁴

For the financial services industry, the cost of regulatory obligations has dramatically increased, such that 87% of banking CEOs in one survey

⁷ See Haldane, *supra* note 1. The idea of using technologies to carry out real-time monitoring of financial institutions and markets is also promoted by some academics and practitioners. See, e.g., Stefano Battiston, et al., *Complexity Theory and Financial Regulation*, 351 SCIENCE 818, 819 (2016) (advocating that “[o]ne ambitious option would be an online, financial-economic dashboard that integrates data, methods, and indicators. This might monitor and stress-test the global socioeconomic and financial system in something close to real time, in a way similar to what is done with other complex systems, such as weather systems or social networks.”).

⁸ See Jeff Cox, *Misbehaving banks have now paid \$204B in fines*, CNBC (Oct. 30, 2015, 1:58 PM), <http://www.cnbc.com/2015/10/30/misbehaving-banks-have-now-paid-204b-in-fines.html>.

⁹ See *Thomson Reuters Annual Cost of Compliance Survey Shows Regulatory Fatigue, Resource Challenges and Personal Liability to Increase throughout 2015*, THOMSON REUTERS (May 13, 2015), <http://thomsonreuters.com/en/press-releases/2015/05/cost-of-compliance-survey-shows-regulatory-fatigue-resource-challenges-personal-liability-to-increase.html>.

¹⁰ See *The Fintech Revolution*, THE ECONOMIST (May 9, 2015), <http://www.economist.com/news/leaders/21650546-wave-startups-changing-finance-for-better-fintech-revolution>.

¹¹ Arner, Barberis & Buckley, *supra* note 2.

¹² See INSTITUTE OF INTERNATIONAL FINANCE, *supra* note 4, at 1 (observing that “[t]he financial crisis of 2008-09 sparked an unprecedented regulatory response across the globe. . . . The new reforms have dramatically increased challenges and costs for the financial sector related to compliance, reporting and supervisory requests.”).

¹³ See *Banks Rushing to Collaborate with FinTech Startups*, FINEXTRA (Sep. 16, 2016), <https://www.finextra.com/newsarticle/29443/banks-rushing-to-collaborate-with-fintech-startups>; EY, *FINTECH: ARE BANKS RESPONDING APPROPRIATELY?* (2015); Andrew Meola, *1 in 5 European Banks Would Buy FinTech Startups*, BUS. INSIDER (July 17, 2016, 11:01 AM), <http://www.businessinsider.com/1-in-5-european-banks-would-buy-fintech-startups-2016-6/?r=AU&IR=T>.

¹⁴ See Gregory Roberts, *FinTech Spawns RegTech to Automate Compliance*, BLOOMBERG (June 28, 2016), <https://www.bloomberg.com/enterprise/blog/fintech-spawns-regtech-automate-compliance-regulations/>.

considered these costs as a source of disruption.¹⁵ This provides a strong economic incentive for more efficient reporting and compliance systems to better control risks and reduce compliance costs. Furthermore, the massive increases in the volume and types of data that have to be reported to regulatory authorities¹⁶ represent a major opportunity for the automation of compliance and monitoring processes. For the financial services industry, the application of technology to regulation and compliance has the scope to massively increase efficiency and achieve better outcomes.

For regulators, RegTech provides the means to move towards a proportionate risk-based approach where access to and management of data enables more granular and effective supervision of markets and market participants.¹⁷ This provides the opportunity to minimize the risks of the regulatory capture witnessed in the run-up to the 2008 GFC¹⁸ as well as being a natural response to the increasingly digital nature of global finance.¹⁹ Furthermore, applying technology to regulation facilitates the monitoring of financial market participants who are becoming increasingly fragmented by the emergence of new FinTech start-ups.²⁰

Enhanced reporting accuracy and decreased compliance costs are not new incentives.²¹ However, as the financial services industry becomes increasingly digitized, the gap between the accuracy and costs of manual and automatic compliance and monitoring is widening. Combined with recent advances in data science and analytics, RegTech's growth can be understood

¹⁵ FERNANDEZ DE LIS, ET AL., *supra* note 5, at 1.

¹⁶ For a comprehensive summary of the various reporting requirements imposed by post-Crisis regulatory reforms, see INSTITUTE OF INTERNATIONAL FINANCE, *supra* note 3, at 5–8.

¹⁷ See IMRAN GULAMHUSEINWALA ET AL., INNOVATING WITH REGTECH - TURNING REGULATORY COMPLIANCE INTO A COMPETITIVE ADVANTAGE 10 (2015) (observing that the development of RegTech will eventually lead financial supervision to a “Compliance by Design” framework which enables automated monitoring of compliance standard by the regulators.).

¹⁸ The argument is that if regulators are able directly to access financial data from supervised firms, this will allow them to form their own evidence-based opinion on the state of the company as opposed to rely on the company's reporting. Similarly, as the amount of data available to regulators increases, their policy decisions and the impact they have on financial markets may be simulated to more accurately predict consequences as opposed to relying on market participants' self-serving opinions.

¹⁹ See Douglas Arner & Janos Barberis, *FinTech in China: From The Shadow?*, 3 J. FIN. PERSPECTIVES 23 (2015).

²⁰ GLOBAL PARTNERSHIP FOR FINANCIAL INCLUSION, G20 HIGH-LEVEL PRINCIPLES FOR DIGITAL FINANCIAL INCLUSION 12 (2016) (highlighting key action plans that “encourage the use of digital technologies, as appropriate, to improve their processes and capacity for supervision.”).

²¹ For example, JP Morgan spent a combined US\$600 million on regulatory and control technology in 2015. INSTITUTE OF INTERNATIONAL FINANCE, *supra* note 4, at 1. According to Thomson Reuters's Annual Cost of Compliance Survey, “[m]ore than two-thirds of firms (68 percent) are expecting an increase in their compliance budget this year (2015) with 19 percent expecting significantly more. G-SIFIs are expecting a noticeably greater increase in compliance team budgets with one third (33 percent) expecting significantly higher budget.” *Thomson Reuters Annual Cost of Compliance Survey Shows Regulatory Fatigue, Resource Challenges and Personal Liability to Increase Throughout 2015*, *supra* note 9.

as process automation to substantially decrease both compliance costs as well as the potential for regulatory actions and fines.²²

Regulation today is benefiting from the automation of reporting and compliance processes. This trend is beginning to enable substantial cost savings for industry and superior monitoring by regulators, such that the early signs of real-time and proportionate regulatory regimes that identify risks and enable more efficient regulatory compliance are beginning to emerge.²³ However, the automation and streamlining of regulatory processes is only an incremental evolution toward a better and more efficient regulatory framework.

In this paper, we seek to analyze the rise of RegTech to aid the understanding of regulators, industry, and the entrepreneurial community. We argue that RegTech developments are at present incremental, but that we are ultimately moving towards a paradigm shift that will necessitate a reconceptualization of financial regulation.

We argue that the transformative potential of technology will only be fully captured by a new and different regulatory framework situated at the nexus of data and digital identity. The developments in FinTech, the tremendous changes in emerging markets, and the recent pro-active stance of regulators (for instance with the development of regulatory sandboxes) may potentially combine to facilitate a transition from one regulatory model to another.²⁴ This paper sets out to provide a conceptual foundation for RegTech and to craft a very rough roadmap that could serve to guide such a transition.

Following this introduction, Part II considers the evolution of RegTech, so as to provide a framework of analysis for the remainder of the paper. Part III considers the first element of this framework, namely the use of technology by financial institutions and the financial industry to meet regulatory requirements, particularly those resulting from reforms in the wake of the 2008 GFC. Part IV discusses the technology used by regulators, regulators' historical relationship with the industry, technological developments, and the challenges for regulators of the postcrisis environment. Part V considers the new challenges of FinTech and the need for RegTech in meeting them. Part VI concludes.

²² DELOITTE, REGTECH IS THE NEW FINTECH: HOW AGILE REGULATORY TECHNOLOGY IS HELPING FIRMS BETTER UNDERSTAND AND MANAGE THEIR RISKS 4 (2015).

²³ For example, in the area of payments transactions monitoring, the IIF observes that “[b]anks both conduct post-facto checks on transactions (taking data inputs from loans, money market, payments and interbank systems), and monitor, flag and block or report illegal transactions in real-time.” INSTITUTE OF INTERNATIONAL FINANCE, *supra* note 3, at 9.

²⁴ Currently there are at least four jurisdictions consulting on (and implementing) this new regulatory approach of the regulatory sandbox. They are the UK, Australia, Singapore and Hong Kong. *See, e.g.*, Australian Securities & Investments Commission, *16-129MR Innovation Hub: Regulatory Sandbox Proposal*, ASIC (May 4, 2016), <http://asic.gov.au/about-asic/media-centre/find-a-media-release/2016-releases/16-129mr-innovation-hub-regulatory-sandbox-proposal/>.

II. REGTECH: A FRAMEWORK OF ANALYSIS

As noted at the outset, regulatory and technological developments over the past decade have changed the nature of financial services and financial institutions in ways quite unexpected prior to the 2008 GFC. We turn first to the intentional aspect of this change: postcrisis regulation. Subsequently we consider the digital transformation in developed countries and the growth in digital financial services in developing countries; and then move on to consider the rise and roles of FinTech startups and RegTech.

A. Postcrisis Regulation

The 2008 crisis and resulting postcrisis financial regulatory reforms have transformed the way in which financial institutions operate, combining to reduce their risk-taking, the spectrum of their operations, and their profitability.²⁵ The mass of new postcrisis regulation has dramatically increased the compliance burden on financial institutions, in addition to the direct cost of regulatory penalties (over \$200 billion globally since the crisis).²⁶

These changes were the intent of the postcrisis regulatory reform agenda.²⁷ In previous work, we (and many others) have analyzed in great detail the development, implementation, evolution, and effectiveness of postcrisis regulatory reforms and their implications.²⁸ This new regulatory environment is one of the major drivers leading to the emergence of RegTech; we return to this issue in Part III.

B. FinTech

With this dramatically altered regulatory, operating, and compliance environment has also come the rapid evolution of technology and its application to finance, namely FinTech. While FinTech as a term has only risen to prominence in the past three years,²⁹ the interaction between finance and technology has a long history, one that we (and increasingly others) have analyzed.³⁰

²⁵ For a brief overview of the postcrisis global mandated reforms and the profound changes in global finance over the past 40 years, see Ross P. Buckley, *Reconceptualizing the Regulation of Global Finance*, 36 OXFORD J. LEGAL STUD. 242 (2016).

²⁶ See Cox, *supra* note 8.

²⁷ See FINANCIAL STABILITY BOARD, IMPLEMENTATION AND EFFECTS OF THE G20 FINANCIAL REGULATORY REFORMS: REPORT TO THE G20 (Aug. 2016).

²⁸ See BUCKLEY & ARNER, *supra* note 2; RECONCEPTUALISING GLOBAL FINANCE AND ITS REGULATION (Ross P. Buckley, Emiliios Avgouleas & Douglas W. Arner eds., 2016).

²⁹ See *Fintech: Interest over Time*, GOOGLE TRENDS, <https://www.google.com/trends/explore#q=fintech> (accessed Sep. 19, 2016).

³⁰ See Arner, Barberis & Buckley, *supra* note 2; Andrew Lo, *Moore's Law vs. Murphy's Law in the*

Today's FinTech landscape is the result of three major evolutionary trends – impacting traditional financial services in global markets, developing countries, and FinTech start-ups.³¹

1. Digital transformation in developed markets

In the developed world the transition from an analogue to a digital financial industry started to occur in the late 1960s with the emergence of the handheld financial calculator and the ATM.³² This was followed by decades of increasingly rapid technological change leading up to the latest decade of extraordinarily swift technological developments. While change has been pervasive, particularly in wholesale institutional markets, two areas highlight the scale of transformation: first, payments, and second, securities markets.

While electronic payment systems date back to the time immediately following the invention of the telegraph, the most important developments have occurred since the early 1970s, with electronic payment systems in developed markets and cross-border payment systems such as SWIFT (Society for Worldwide Interbank Financial Telecommunications)³³ and VISA,³⁴ the establishment of RTGS (real time gross settlement systems) in the 1980s and 1990s,³⁵ and the creation of CLS (Continuous Linked Settlement),³⁶ culminating in today's \$5.1 trillion-a-day global foreign exchange markets.³⁷

This multidecade process took place through a carefully developed partnership between major central banks and financial institutions, targeted

Financial System: Who's Winning? (Bank for International Settlement, Working Paper No. 564, May 2016).

³¹ Arner, Barberis & Buckley, *supra* note 2.

³² Anuli Akanegbu & Ricky Ribero, *Calculating Firsts: A Visual History of Calculators*, EDTECH MAGAZINE (Nov. 20, 2012), <http://www.edtechmagazine.com/k12/article/2012/11/calculating-firsts-visual-history-calculators>; Brian Milligan, *The Man Who Invented the Cash Machine*, BBC NEWS (June 25, 2007), <http://news.bbc.co.uk/2/hi/business/6230194.stm>.

³³ SWIFT was founded in the 1970s. *SWIFT History*, SWIFT, <https://www.swift.com/about-us/history>.

³⁴ VISA was launched in 1958. *History of Visa: Our Journey*, VISA, https://usa.visa.com/about-visa/our_business/history-of-visa.html.

³⁵ See PETER ALLSOPP, BRUCE SUMMERS & JOHN VEALE, THE EVOLUTION OF REAL-TIME GROSS SETTLEMENT: ACCESS, LIQUIDITY AND CREDIT, AND PRICING (Feb. 2009). For a more recent example in developing countries like Zambia, see *The Zambian Interbank Payment and Settlement System (ZIPSS)*, BANK OF ZAMBIA, <http://www.boz.zm/zipss.htm>.

³⁶ See JÜRIG MÄGERLE & DAVID MAURER, THE CONTINUOUS LINKED SETTLEMENT FOREIGN EXCHANGE SETTLEMENT SYSTEM (CLS) (2009), http://www.snb.ch/en/mmr/reference/continuous_linked_settlement/source/continuous_linked_settlement.en.pdf.

³⁷ See *Triennial Central Bank Survey of Foreign Exchange and OTC Derivatives Markets in 2016*, BANK FOR INTERNATIONAL SETTLEMENTS (last updated Sep. 1, 2016), <http://www.bis.org/publ/rpx16.htm>; Reuters, *Forex Volumes in June Hit Above \$5 Trillion a Day*, FORTUNE (July 14, 2016), <http://fortune.com/2016/07/14/forex-volumes-june-brexite/>.

at both supporting economic and financial globalization, and reducing the serious risks inherent in cross-border payments, particularly systemic risks.³⁸ This is an important example of precrisis RegTech as well as in the evolution of FinTech.³⁹

In addition – and importantly from the standpoint of other major trends – this global payments infrastructure also provided the basis for the rise of alternative payment systems such as PayPal and AliPay.⁴⁰

In the context of securities markets, since the early 1970s, markets have transformed from 19th century paper-based physical systems to today's virtual electronic markets, characterized by high frequency and algorithmic trading: the world of the “flash boys.”⁴¹ This trend began in 1971 with the establishment of NASDAQ, the first fully electronic securities market,⁴² with major consequences including the 1987 stock market crash (program trading), the dot.com bubble and collapse in 2001, and the flash crash of 2010. Once again, this transformation arose from an interaction between major market participants and regulators, focused on improving efficiency and risk management while seeking to control risks to investors and markets.⁴³ This interaction can be seen in the context of the National Market System (NMS) in the United States and the Investment Services Directive (ISD), Markets in Financial Instruments Directive (MiFID) and European Market Infrastructure Regulation (EMIR) in the EU. Today, of course, the majority of securities trading involves computers trading with each other, with humans as minority participants who almost never interact outside the electronic environment.⁴⁴

³⁸ For example, they attempted to reduce risks like Herstatt risk (cross-currency settlement risk). *The Long, Dark Shadow of Herstatt*, THE ECONOMIST (April 12, 2001), <http://www.economist.com/node/574236>.

³⁹ For example, the IIF highlights in its RegTech Report that “[n]ear real-time settlement could be achieved through automation and global consensus on the blockchain. These capabilities could automate compliance aspects in use cases including cross-border payments, syndicated loans, and repo markets.” Institute of International Finance, *supra* note 3, at 15.

⁴⁰ See Henry Helgeson, *How China and Kenya are Winning the Payment Wars – and Why the US Should Worry*, FORBES (Aug. 18, 2014), <http://www.forbes.com/sites/groupthink/2014/08/18/how-china-and-kenya-are-winning-the-payment-wars-and-why-the-u-s-should-worry/#1503b8c56241>.

⁴¹ See MICHAEL LEWIS, *FLASH BOYS: A WALL STREET REVOLT* (1st ed., 2015).

⁴² *Nasdaq's Story*, NASDAQ, <http://business.nasdaq.com/discover/nasdaq-story>.

⁴³ For a brief but comprehensive summary of the role of regulators and regulations in the development of electronic markets and high frequency trading, see ANUJ AGARWAL, *HIGH FREQUENCY TRADING: EVOLUTION AND THE FUTURE*, CAPGEMINI, at 19–20 (2012).

⁴⁴ Trading is now dominated by high-frequency and computerized trading. Bradley Hope, *5 Things to Know about High-Frequency Trading*, WALL ST. J. BLOG (Apr. 2, 2014), <http://blogs.wsj.com/briefly/2014/04/02/5-things-to-know-about-high-frequency-trading/>. The Financial Times also reports that “[h]uman investment managers are at risk of being rendered obsolete by rapid advances in algorithmic trading technology.” Miles Johnson, *Human Investment Managers Risk Obsolescence*, FIN. TIMES (Jan. 25, 2015), <http://www.ft.com/cms/s/0/17129fc0-a48c-11e4-8959-00144feab7de.html#axzz4KHL25EFp>.

2. Digital financial services in developing countries

Finance for economic development has long been an important focus for policy makers seeking to support growth in developing countries.⁴⁵ The emergence of the mobile telephone in the 1980s and its rapid expansion in developing countries from the 1990s set the stage for one of the most important developmental transformations: the emergence of digital financial services (DFS).

DFS are based on the idea of using mobile telephones or other digital platforms to increase access to finance.⁴⁶ This is a response to the infrastructure gap that arises when mobile penetration is high, but physical banking infrastructure (and thus financial inclusion) is very low, meaning DFS are the most efficient delivery mechanism for financial products and services. At the first level, the rapid adoption of mobile telephones across large populations previously without access to communications technology provided the necessary infrastructure. Once mobile phones became widely used and available, network effects combined with unmet demand (in this case for financial services) provided the opportunity to use the new, widely available technology to provide access to financial services. The result has been (particularly in parts of Africa) a real success story of increasing financial inclusion and economic growth.⁴⁷

Unlike the digitization of developed country wholesale and institutional markets, in general DFS in most developing countries has developed independently of the efforts of financial regulators, and it was usually led by mobile telecommunications companies.⁴⁸ In many cases, financial regulators only began addressing potential risks to consumers and financial stability once mobile payments had already become of major importance in the domestic financial system.

⁴⁵ See DOUGLAS ARNER, FINANCIAL STABILITY, ECONOMIC GROWTH AND THE ROLE OF LAW (2007).

⁴⁶ This idea is also known as “digital financial inclusion” which “refers broadly to the use of digital financial services to advance financial inclusion. It involves the deployment of digital means to reach financially excluded and underserved populations with a range of formal financial services suited to their needs, delivered responsibly at a cost affordable to customers and sustainable for providers.” GLOBAL PARTNERSHIP FOR FINANCIAL INCLUSION, GLOBAL STANDARD-SETTING BODIES AND FINANCIAL INCLUSION: THE EVOLVING LANDSCAPE 46 (March 2016).

⁴⁷ See e.g., BANK OF ZAMBIA, FINSCOPE ZAMBIA 2015 1 (2015).

⁴⁸ See *Financial Services in Africa*, KPMG 4 (2013), <https://www.kpmg.com/Africa/en/IssuesAndInsights/Articles-Publications/Documents/KPMG%20Financial%20Services%20in%20Africa.pdf>; Daniel Runde, *M-Pesa And The Rise Of The Global Mobile Money Market*, FORBES (Aug. 12, 2015), <http://www.forbes.com/sites/danielrunde/2015/08/12/m-pesa-and-the-rise-of-the-global-mobile-money-market/>.

3. *FinTech start-ups*

The third major element, and the one that typically receives the most press attention today, has been the emergence of new entrants, often start-ups, focused on combining new technology and finance for the benefit of consumers. While successful FinTech start-ups are by no means new (e.g. Bloomberg in the 1980s and PayPal in the late 1990s), their numbers and profile have increased dramatically since 2008. This is reflected in the rise of the noun “FinTech” (meaning a new start-up company applying technology to finance). While the focus is often on alternative financial techniques such as crowdfunding, P2P (peer to peer) lending and robo-advisory services, in fact, this trend also embraces established IT and ecommerce firms (such as IBM, Tata, Apple, Amazon, and Alibaba) and new start-ups, all applying technology to address challenges and create opportunities across the financial sector.

Today, FinTech impacts every area of the financial system in virtually every part of the world, with the most dramatic impact perhaps in China, where technology firms such as Alibaba, Baidu, and Tencent (BATs) have transformed finance and raised new challenges for regulators and regulation.⁴⁹ Furthermore, since 2016 regulators in a range of countries including the United States, Australia, Singapore, and the UK have been actively engaged in better understanding FinTech market dynamics and seeking to develop new regulatory approaches.⁵⁰

C. RegTech

Unlike the UK’s Financial Conduct Authority (FCA), we argue that RegTech cannot be simplified as a category of FinTech. According to the FCA: “RegTech is a sub-set of FinTech that focuses on technologies that may facilitate the delivery of regulatory requirements more *efficiently* and *effectively* than *existing* capabilities.”⁵¹ This is a pragmatic assessment of where RegTech is today, but it is made from an overly narrow perspective.

In our view, this definition lacks vision as to the true potential of

⁴⁹ See Weihuan Zhou, Douglas W. Arner & Ross P. Buckley, *Regulation of Digital Financial Services in China: Last Mover Advantage*, 8 TSINGHUA CHINA L. REV. 25 (2015); Arner & Barberis, *supra* note 19.

⁵⁰ For example, the rationale behind the launch of regulatory sandboxes in the UK, Australia, and Singapore is that regulators will then be able to support innovation in financial services by collaborating with industry to better understand FinTech market dynamics. See ASIC, *Fintech: ASIC’s Approach and Regulatory Issues* 10–12 (Paper submitted to the 21st Melbourne Money & Finance Conference, July 2016); ASIC, *Further Measures to Facilitate Innovation in Financial Services* (Consultation Paper No. 260, June 2016).

⁵¹ Feedback Statement, Financial Conduct Authority, Call for Input on Supporting the Development and Adopters of RegTech 3 (2016) (emphasis added).

RegTech.⁵² RegTech represents more than just an efficiency tool and rather is a pivotal change leading to a paradigm shift in regulation. Viewed holistically, RegTech represents the next logical evolution of financial services regulation and should develop into a foundational base underpinning the entire financial services sector.

In the near future, the application of technology to monitoring and compliance offers massive cost savings to established financial companies and potentially massive opportunities to emerging FinTech start-ups, IT firms, and advisory firms.⁵³ From a regulator's perspective, RegTech enables the prospect of continuous monitoring that would improve efficiency by both liberating excess regulatory capital⁵⁴ and decreasing the time it takes to investigate a firm following a compliance breach.⁵⁵ RegTech however offers more: the potential of continuous monitoring capacity, providing close to real-time insights, through deep learning and artificial intelligence (AI) filters, into the functioning of the markets nationally and globally. This would allow regulators to look forward to identify problems in advance rather than simply taking enforcement action after the fact. It is this that so excites Andy Haldane, and for which we argue in this paper. Relative to what regulators have at their disposal today, this is a profound transformation in the approach to both finance and its regulation, and one that would certainly meet with the approval of Captain Kirk's dour engineer, Scotty.

In the long run, while FinTech is inherently financial in its focus,

⁵² *Id.* For a thorough analysis of the FinTech sector, see Arner, Barberis & Buckley, *supra* note 2.

⁵³ Adrian Shedden & Gareth Malna, *Supporting the Development and Adoption of RegTech: No Better Time for a Call for Input*, BURGESS SALMON 2 (Jan. 2016), https://www.burgess-salmon.com/media/files/publications/open-access/supporting_the_development_and_adoption_of_regtech_no_better_time_for_a_call_for_input.pdf.

⁵⁴ For example, in the case of the new U.S. leverage ratio requirements, banks often complain that the requirements would force banks to shed liquid assets that would otherwise be needed to maintain the LCR requirements. In the words of Citigroup's comment letter on the August 20, 2013 joint agency notice of proposed rulemaking entitled *Regulatory Capital Rules: Regulatory Capital, Enhanced Supplementary Leverage Ratio Standards for Certain Bank Holding Companies and Their Subsidiary Insured Depository Institutions*, "[t]he interaction of different leverage, capital, liquidity, debt and wholesale funding-related requirements is not well-understood, but in fact may lead to incentives that increase risk in this system, as banks seek to 'optimize' their balance sheet structure across these different requirements." Comment Letter from Citigroup, Comment Letter on Regulatory Capital Rules: Enhanced Supplementary Leverage Ratio Standards for Certain Bank Holding Companies and Their Subsidiary Insured Depository Institution, 3 (Oct. 21, 2013), https://www.federalreserve.gov/SECRS/2013/October/20131030/R-1460/R-1460_102113_111420_579523237031_1.pdf. Similarly, banks and trade associations also pointed out that the Net Stable Funding Ratio and its short-term counterpart, the Liquidity Coverage Ratio, under the U.S. Basel III regime impose unnecessary costs on banks by "penalizing" securities trading activities. See John Heltman, *Long-Term Liquidity Plan Is Costly and Redundant, Banks Argue*, AMERICAN BANKER (Aug. 12, 2016), <http://www.americanbanker.com/news/law-regulation/long-term-liquidity-plan-is-costly-and-redundant-banks-argue-1090708-1.html>.

⁵⁵ Daniel Gutierrez, *Big Data for Finance – Security and Regulatory Compliance Considerations*, INSIDE BIG DATA (Oct. 20, 2014), <http://insidebigdata.com/2014/10/20/big-data-finance-security-regulatory-compliance-considerations/>.

RegTech has the potential for application in a wide range of contexts from monitoring corporations for environmental compliance to monitoring trucking companies for speeding infractions to tracking the global location of airliners on a real-time basis. As our financial system moves from one based on Know-Your-Customer principles to one based on a Know-Your-Data approach, an entirely new regulatory paradigm that will have to deal with everything from digital identity to data sovereignty, and that will extend far beyond the financial sphere, likewise must evolve.

It is therefore critical to distinguish RegTech from FinTech. The conception that RegTech is a subset of FinTech may come from the fact that the GFC served to catalyze both developments. However, their underlying causes were different.

The emergence of RegTech is attributable to: (1) postcrisis regulation changes requiring massive additional data disclosure from supervised entities;⁵⁶ (2) developments in data science (for instance AI and deep learning) that allow the structuring of unstructured data;⁵⁷ (3) economic incentives for participants to minimize rapidly rising compliance costs; and (4) regulators' efforts to enhance the efficiency of supervisory tools to foster competition and uphold their mandates of financial stability (both macro and micro) and market integrity.⁵⁸

The emergence of FinTech is attributable to: (1) financial market deficiencies caused by the GFC and the regulatory response to it; (2) public distrust in the financial services industry, particularly in the United States and EU; (3) political pressure for alternative sources of finance for small and medium enterprises; (4) unemployed financial professionals looking to apply their talents; and (5) the commoditization of technology and the market penetration of the internet and mobile phones, particularly smart phones.⁵⁹

From a market dynamic perspective, FinTech since 2008 has grown organically as a bottom-up movement led by start-ups and IT firms, whilst RegTech has grown mainly in response to top-down institutional demand. RegTech can therefore be seen encompassing three distinct, but complementary, market sectors and groups of participants.

Firstly (and most advanced at present) financial institutions and the financial industry are increasingly applying technology to meet the demands

⁵⁶ See Institute of International Finance, *supra* note 3, at 5–8.

⁵⁷ The IIF identified a number of new technologies that could improve data management and analysis which include new cryptographic technology, data mining algorithms, machine learning, blockchain, robotics, and visual analytics. *Id.* at 12–14.

⁵⁸ For example, Principle 9 of the BCBS's "Core Principles for Effective Banking Supervision" requires financial supervisors to use an appropriate range of techniques and tools to effectively implement the supervisory approach and deploy supervisory resources. This includes a criteria that "[t]he supervisor uses a variety of tools to regularly review and assess the safety and soundness of banks and the banking system." BASEL COMMITTEE ON BANKING SUPERVISION, CORE PRINCIPLES FOR EFFECTIVE BANKING SUPERVISION 30-31 (2012).

⁵⁹ Arner, Barberis & Buckley, *supra* note 2, at 23.

of regulators, especially demands upon large financial institutions in developed markets arising from new postcrisis regulations.

Secondly, regulators, similar to the financial services industry, are faced with the need to use technology to address the challenges of monitoring and enforcing increasingly demanding regulatory requirements on fast-changing, rapidly growing and cross-border markets. In addition, regulators, particularly in developing countries and most dramatically in China, are facing the challenges of the rapid emergence of new FinTech technologies and entrants, all at unprecedented speed. Regulators are faced with the need to develop regulatory approaches that do not hinder development and innovation while still limiting risks to consumers and financial stability.⁶⁰

Thirdly, and to date still at a very nascent level, policy makers and regulators will face the challenge of rapidly transforming financial systems in coming years, and of building the necessary infrastructure to support their regulation, which will necessitate the increasing use of, and reliance on, RegTech. This will have to take place in close cooperation with industry participants of all sorts.

As a result of the above, the development of RegTech so far has primarily been driven by the financial services industry wishing to decrease costs,⁶¹ especially in light of the fact that regulatory fines and settlements have increased forty-five fold.⁶² The next stage is likely to be driven by regulators seeking to increase their supervisory capacity. We can therefore expect RegTech to focus more on business-to-business (B2B) solutions in contrast to the FinTech sector in which a large numbers of companies focus on business-to-consumer (B2C), as well as B2B, solutions.⁶³

We begin by considering the most developed space in today's RegTech landscape: traditional financial institutions.

III. FINANCIAL INSTITUTIONS: COMPLIANCE AND REGTECH

Traditional financial institutions, particularly large global banks, have

⁶⁰ See OFFICE OF THE COMPTROLLER OF CURRENCY, SUPPORTING RESPONSIBLE INNOVATION IN THE FEDERAL BANKING SYSTEM: AN OCC PERSPECTIVE (2016).

⁶¹ It was reported that JP Morgan Chase added 13,000 employees at a cost of US\$2 billion between 2012 and 2014. Likewise, Deutsche Bank and UBS spent respectively EUR1.2 billion and US\$946 million on regulatory demands in 2014. See Institute of International Finance, *supra* note 4, at 1.

⁶² Piotr Kaminski & Kate Robu, *A Best-Practice Model for Bank Compliance*, MCKINSEY, Exhibit 1 (Jan. 2016), <http://www.mckinsey.com/business-functions/risk/our-insights/a-best-practice-model-for-bank-compliance>.

⁶³ For example, the most highly funded FinTech verticals are in the Payment and Financing space, which provide direct services to consumers. Furthermore, the rise of challenger banks post-2007 is also an expression of the public demand and policy motivation to increase heterogeneity within the retail banking sector in the UK. For additional details on the UK Challenger Banking Space, please refer to WARREN MEAD, RICHARD IFERENTA & ROBERT HIBBERT, *A NEW LANDSCAPE: CHALLENGER BANKING ANNUAL RESULT* (2016).

been the major drivers of the post-2008 evolution of RegTech, stemming from their appetite for efficient tools with which to deal with massive new and complex regulatory and compliance demands. Financial institutions began applying technology intensively to risk management and compliance in the 1990s, with regulators placing a high level of trust and reliance on such systems. However, the GFC fundamentally altered that paradigm. Since the crisis, regulators globally have implemented far reaching and extensive regulatory reforms and compliance requirements, which have driven the evolution of IT and compliance in major financial institutions worldwide. In order to address these challenges, global firms are now developing global centralized risk management and compliance functions in order to address the changed regulatory and compliance environments.⁶⁴

A. Globalization of Finance and the Development of RegTech

The history of global financial regulation is in large measure the story of regulatory initiatives in response to crisis. For example, the extensive financial liberalization and deregulation of the 1970s was followed by the Developing Country Debt Crisis of 1982, which in turn provided the impetus for the first Basel Accord on capital adequacy in the late 1980s.⁶⁵

This was an iterative process of liberalization, followed by crisis, and then reactive regulatory responses.⁶⁶ As markets became more international from the late 1960s and increasingly global from the 1980s, domestic regulation became increasingly inadequate to address the challenges of cross-border, international, and global financial markets and institutions. In response, a network of cooperative arrangements between policy makers and global standard-setting bodies gradually evolved to address new risks arising from the internationalization and globalization of finance. This network was centered on organizations including the Bank for International Settlements (BIS), the Basel Committee on Banking Supervision (Basel Committee), the Financial Action Task Force on Money Laundering (FATF), the Financial Stability Forum, and the Group of Seven (G-7) Industrialized Countries.⁶⁷ These organizations, comprised primarily of domestic regulatory agencies from major developed financial markets, came together following each major crisis (Herstatt in the 1970s, the Developing Country Debt Crisis of the 1980s, the Mexican and Asian Financial Crises, and the failures of BCCI and

⁶⁴ See EY, CENTRALIZED OPERATIONS - THE FUTURE OF OPERATING MODELS FOR RISK, CONTROL AND COMPLIANCE FUNCTIONS (2014).

⁶⁵ *Capital Standards for Banks: The Evolving Basel Accord* (Federal Reserve Bulletin), Sep. 2003.

⁶⁶ For the development of this framework, see Buckley & Arner, *supra* note 2.

⁶⁷ Lawrence G. Baxter, *Understanding the Global in Global Finance and Regulation*, in *RECONCEPTUALIZING GLOBAL FINANCE AND ITS REGULATION* 28-48 (Ross Buckley et al. eds., 2016); see generally CHRIS BRUMMER, *SOFT LAW AND THE GLOBAL FINANCIAL SYSTEM: RULE MAKING IN THE 21ST CENTURY* (2011).

Barings of the 1990s) to agree on further coordinated regulatory responses to prevent similar problems in future. Major examples of such “soft law” financial regulatory agreements thus developed include the 1988 Basel Capital Accord (Basel I),⁶⁸ its replacement (Basel II),⁶⁹ and the FATF’s 40 Recommendations.⁷⁰

From the standpoint of financial institutions, the period from the late 1960s to the 2008 GFC was one of continual expansion in scope and scale, culminating in huge global financial conglomerates.⁷¹ This took place through organic growth and more significantly through mergers and acquisitions, with the merger of Travelers and Citibank to form Citigroup in 1999 being paradigmatic (as illustrated in Figure 1.0).⁷²

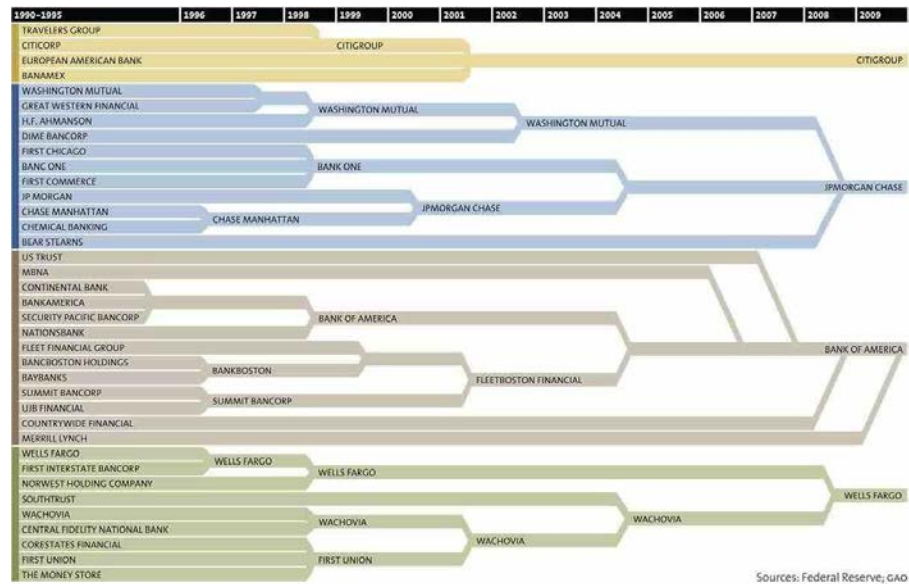


Figure 1. Infographic based on information from the Federal Reserve and GAO depicting how thirty-seven banks became the “Big Four” between 1990 and 2009.

⁶⁸ See BIS, INTERNATIONAL CONVERGENCE OF CAPITAL MEASUREMENT AND CAPITAL STANDARDS (1998).

⁶⁹ See BIS, BASEL II: INTERNATIONAL CONVERGENCE OF CAPITAL MEASUREMENT AND CAPITAL STANDARDS: A REVISED FRAMEWORK – COMPREHENSIVE VERSION (2006).

⁷⁰ See FATF, FATF 40 RECOMMENDATIONS (Oct. 2003); Brummer, *supra* note 67.

⁷¹ See Ross P. Buckley, *The Changing Nature of Banking and Why It Matters, in RECONCEPTUALIZING GLOBAL FINANCE AND ITS REGULATION 9-27* (Ross Buckley, et al. eds., 2016).

⁷² *How 37 Banks in 1990s Became 4 Banks in 2009, Mega Consolidation in US*, LET’S TALK PAYMENTS, (Jan. 29, 2014), <https://letstalkpayments.com/37-banks-1999-2009-became-4-banks-today-mega-consolidation/> (citing Federal Reserve; GAO).

Source: *How Banks Got Too Big to Fail*, MOTHER JONES (Jan.–Feb. 2010), <http://www.motherjones.com/politics/2010/01/bank-merger-history/#>.

As financial institutions expanded their scope and scale across jurisdictions and sectors, they faced increasing operational and regulatory challenges. This led to a major expansion of risk management and legal and compliance activities, particularly throughout the 1990s and 2000s. Risk management from the 1980s was increasingly achieved by using financial technology as finance became increasingly quantitative and IT became ever more powerful. The combination of quantitative finance and IT was reflected in the emergence of financial engineering and Value at Risk (VaR) systems in major financial institutions.⁷³ These systems were a major element of the transformation of finance prior to the GFC, but also one of the greatest risks and failures underlying the crisis itself.⁷⁴ Put simply, by the early twenty-first century, the financial industry—particularly very large global financial institutions and their staff, management, and shareholders—had become overly confident in the ability to manage and control risks through the application of quantitative finance and IT.⁷⁵

Regulators too became overly confident in the ability of this quantitative IT framework to manage risks, as is demonstrated by the heavy reliance of the Basel II Capital Accord on quantitative internal risk management systems of major global financial institutions.⁷⁶ Essentially, regulators outsourced major aspects of financial regulation to the largest industry participants and their internal risk control mechanisms.

These two aspects of reliance on quantitative risk management systems by industry and regulators could be viewed as the first iteration of RegTech,

⁷³ See Joe Nocera, *Risk Management – What Led to the Financial Meltdown*, NY TIMES (Jan. 2, 2009), <http://www.nytimes.com/2009/01/04/magazine/04risk-t.html>.

⁷⁴ The VaR model is unreliable in many ways. See Simon Johnson & James Kwak, *Seduced by a Model*, NY TIMES ECONOMIX BLOG (Oct. 1, 2009), <http://economix.blogs.nytimes.com/2009/10/01/seduced-by-a-model/>. (“VAR depends on three assumptions that are generally false: not all assets, particularly illiquid ones, are included in the VAR calculation; estimates are based on past data that is unrepresentative of the future; and because financial returns exhibit ‘fat tails’ (extreme outcomes are more likely than you would expect), VAR estimates tell you very little about how bad things can get that last 1 percent of the time.”). For an empirical study on the limitations of the VaR model, see Andreas Krause, *Exploring the Limitations of Value at Risk: How Good Is It in Practice?*, 4 J. RISK FIN. 19 (2003).

⁷⁵ Overreliance on financial technology such as VaR (estimated through the use of Gaussian copula function) that allowed hugely complex risks to be modelled was perhaps what destroyed Wall Street according to one commentator. Felix Salmon, *The Formula that Killed Wall Street*, 9 SIGNIFICANCE 16 (2012).

⁷⁶ See Harald Benink & George Kaufman, *Turmoil Reveals the Inadequacy of Basel II*, FIN. TIMES, (Feb. 27, 2008), <https://www.ft.com/content/0e8404a2-e54e-11dc-9334-0000779fd2ac>; Staffs of the International Monetary Fund and The World Bank, *Implementation of Basel II – Implications for the World Bank and the IMF*, INTERNATIONAL MONETARY FUND (July 22, 2005), <http://www.imf.org/external/np/pp/eng/2005/072205.htm#s2>.

a sort of RegTech 1.0. Unfortunately, this precrisis partnership between the financial industry and its regulators, based on quantitative internal risk management systems, provided a false sense of security and confidence⁷⁷ that was shattered by the 2008 GFC.

B. RegTech in the Financial Services Industry: Impact of the 2008 Global Financial Crisis

To date, traditional financial institutions and their risk management and compliance needs have been the primary driver of, and market for, RegTech solutions. While the financial services industry has long been a major user of automated reporting and compliance tools, increased regulatory costs since 2008 have enhanced the incentive to shift quickly to adopt digitization and automation of processes as the default method of meeting regulatory obligations.

The emergence of RegTech can be largely attributed to the *complex, fragmented* and *ever-evolving* post-GFC global financial regulatory regime. Over-reliance on complex, prescriptive and lengthy post-GFC regulations led to massive compliance and supervision costs for the regulated and the regulators. Carrying out financial supervision, in response to the growing level of regulatory complexity, inevitably required greater granularity, precision and frequency in data reporting, aggregation, and analysis.⁷⁸

Examples can be easily found in the case of capital and liquidity regulations under Basel III, stress testing and risk assessments in the UK, United States, EU, and elsewhere, and the reporting requirements imposed on OTC derivatives transactions resulting from Group of 20 (G20) and Financial Stability Board (FSB) agreed approaches and as implemented (in conflicting fashions) in the context of Dodd-Frank or the EU's EMIR.⁷⁹ Compliance costs rose significantly as a result of the increasing regulatory burden that made the use of innovative technologies a natural and promising solution to compliance requirements.⁸⁰ As reported by Let's Talk Payments,

⁷⁷ One example is that Basel II's Internal Ratings-Based (IRB) approach was perceived to achieve two major goals: the enhancement of risk sensitivity, and the promotion of incentive compatibility. Nevertheless, in hindsight, the pursuit of risk sensitivity was mostly accomplished by banks pushing assets off their balance sheets, leading to a false sense of security.

⁷⁸ Institute of International Finance, *supra* note 3, at 5–8.

⁷⁹ *Id.* at 7. For discussion in the context of the US, see FINANCIAL STABILITY OVERSIGHT COUNCIL, STUDY ON THE EFFECTS OF SIZE AND COMPLEXITY OF FINANCIAL INSTITUTIONS ON CAPITAL MARKET EFFICIENCY AND ECONOMIC GROWTH CARRIED OUT AT THE DIRECTION OF THE CHAIRMAN OF THE FINANCIAL STABILITY OVERSIGHT COUNCIL (March 2016).

⁸⁰ See Eleanor Hill, *Is RegTech the Answer to the Rising Cost of Compliance?*, FX-MM (June 13, 2016), <http://www.fx-mm.com/50368/fx-mm-magazine/past-issues/june-2016/regtech-rising-cost-compliance/> (noting that “[a]s rules of thumb go, judging regulatory complexity by the amount of paperwork being issued by global regulators is not a bad proxy. Between 2009 and 2014, G20 regulators increased their document output by 500%”); Andrew Cornell, *AgTech, ResTech, RegTech, FinTech* –

“[t]he annual spending by financial institutions on compliance is estimated to be in excess of US \$70 billion.”⁸¹ In this situation it is no wonder the industry turned to RegTech for cost-effective solutions.

Second, the deepening regulatory fragmentation displayed in many different markets has given rise to an additional layer of compliance burdens for financial institutions. Despite the push by global policy makers for similar postcrisis reforms, the requirements and rules for implementing these reforms range from being slightly different to significantly dissimilar between markets. The overlaps and contradictions in regulations led financial institutions to turn to RegTech to optimize compliance management.⁸²

Third, the rapidly evolving nature of the postcrisis regulatory landscape introduced uncertainty on future regulatory requirements which put a premium on financial institutions enhancing their *adaptability* in regulatory compliance.⁸³ The use of RegTech may have taught financial institutions how to ensure compliance in a changing dynamic environment through iterative modeling and testing.

Last but not least, the regulators themselves are becoming motivated to explore the use of RegTech to ensure financial institutions comply with regulations in a responsive manner.⁸⁴ The use of RegTech can add value to regulators by helping them understand, in closer to real-time, innovative products and complex transactions, market manipulation, internal fraud, and risks,⁸⁵ which we discuss in Part IV.

According to the Spanish international bank BBVA, financial industry RegTech focuses on:

The automation of manual processes and the links between steps in analytical/reporting processes, the improvement of data quality, the creation of a holistic view of data, the automated analysis of data with applications that are able to learn during the process, and the generation of meaningful reports that can be sent to regulators and

Actual Solutions or Techno-Babble?, ANZ BLUE NOTES (Feb. 23, 2016), <https://bluenotes.anz.com/posts/2016/02/is-regtech-the-answer-to-billions-being-spent-on-compliance-and-reporting/>; James Evers, *Welcome to the New World of RegTech*, FIN. REVIEW (June 20, 2016), <http://www.afr.com/technology/welcome-to-the-new-world-of-regtech-20160619-gpmj6k>.

⁸¹ Kate, *A Report on Global RegTech: A \$100-Billion Opportunity – Market Overview, Analysis of Incumbents and Startups*, LET’S TALK PAYMENTS (April 18, 2016), <https://letstalkpayments.com/a-report-on-global-regtech-a-100-billion-opportunity-market-overview-analysis-of-incumbents-and-startups/>.

⁸² See Hill, *supra* note 80.

⁸³ See *id.*

⁸⁴ In fact, some financial regulators are keen to embrace innovation in regulatory techniques. See Evers, *supra* note 80 (observing that Australia’s ASIC chairman, Greg Medcraft, says “ASIC has been thinking about regtech for several years – since before the term has emerged. ASIC is about to establish a dedicated regtech team, and its staff will begin working with researchers.”).

⁸⁵ See Hannah Augur, *Regtech: The 2016 Buzzword is Turning Heads*, DATAACONOMY (May 3, 2016), <http://dataaconomy.com/regtech-the-2016-buzzword-is-turning-heads/>.

used internally to improve key business decision making.⁸⁶

In other words, RegTech embodies technological solutions to improved regulatory processes and related compliance. Additionally, new technological developments (such as AI and machine learning) allow for new forms of market monitoring or reporting processes which were previously not possible.⁸⁷ Indeed, the Bank of England is closely looking at the evolution of RegTech, stating that:

“Firms have started to make progress in response to the limitations of existing surveillance solutions, including the use of *new technology and analytics which go beyond* the key-word surveillance and simple statistical checks previously used by firms to detect improper trading activity . . .”⁸⁸

As noted, this has been driven in the first instance by postcrisis regulatory reforms and the demands of regulators, with the application of technology the enabling factor. Leading examples include anti-money laundering (AML) and know-your-client (KYC) compliance requirements and prudential regulatory reporting and stress testing compliance requirements.

1. AML and KYC

As previously mentioned, FATF, an organization of developed country governments established in 1989 and hosted by the OECD, establishes international soft law standards that address money laundering and terrorist financing. The 40 Recommendations of the FATF have now been implemented into the domestic legal systems of most jurisdictions in the international financial system.⁸⁹ While the FATF does not have a formal treaty-based structure, its pronouncements nonetheless have wide impact, with noncompliant jurisdictions and financial institutions at risk of having their access to major markets such as the United States and EU limited by those domestic regulators. In addition to the FATF and its Recommendations, the UN is also active in issuing sanctions lists of prohibited or restricted countries, firms and individuals.⁹⁰ Unlike FATF Recommendations, UN

⁸⁶ See Santiago Fernandez De Lis et al., RegTech, the New Magic Word in FinTech, BBVA Research 1, 14 (March 2016), https://www.bbva.com/en/wp-content/uploads/2016/03/BBVA-Research-Outlook-Q116_Cap6.pdf.

⁸⁷ See Institute of International Finance, *supra* note 3, at 11–14.

⁸⁸ Charles Roxburgh et al., Fair and Effective Market Review: Final Report (June 2015), <http://www.bankofengland.co.uk/markets/Documents/femrjun15.pdf> (emphasis added).

⁸⁹ FATF, *International Standards on Combating Money Laundering and the Financing of Terrorism & Proliferation: the FATF Recommendations*, (Feb. 2012), http://www.fatf-gafi.org/media/fatf/documents/recommendations/pdfs/FATF_Recommendations.pdf.

⁹⁰ UN Counter-Terrorism Implementation Task Force, *Tackling the Financing of Terrorism*, United Nations 1, 3, 9 (Oct. 2009), http://www.un.org/en/terrorism/ctitf/pdfs/ctitf_financing_eng_final.pdf. See also *Id.* at 19. (“Under Security Council Resolution 1267 (1999) and its successors, the Security Council

sanctions lists do in fact have a formal international legal basis.

The impact of both FATF rules and UN sanctions on the operations of financial institutions around the world has been dramatic, with AML operations within large financial institutions often forming a major division tasked with implementing AML rules and the sanctions imposed by the various jurisdictions in which the institution operates, particularly those of its home jurisdiction and of the United States (given the primacy of the U.S. dollar in international transactions and U.S. activism in enforcement). In addition to operations of individual financial institutions, infrastructure providers such as SWIFT and CLS are important implementers of AML and sanctions.⁹¹

Despite the 40 Recommendations being an internationally agreed, harmonized standard, they must still be implemented in the domestic legal systems of individual jurisdictions. The result is that although the standards are common, the details of their implementation from jurisdiction to jurisdiction may vary. Within individual jurisdictions there may even be differential implementation across regulatory authorities (for example, the banking regulator and the securities regulator may have slightly different requirements in implementing an internationally agreed standard).

From the standpoint of compliance, a number of issues arise.

First, every client or potential client of a financial institution must be reviewed under the central element of the AML requirements, that of knowing one's customer. This is an intensive process that requires documentation of identity, income, source of funds, and the like, at a deeper than surface level. For a large financial institution with operations in multiple countries with thousands of customers, this is a demanding process that is generally established and implemented through the firm's internal IT, risk management, and compliance systems.⁹²

Second, because of differences between the requirements of individual jurisdictions, firms operating across multiple markets have to implement systems (usually IT-based) that address not only the general global requirements, but also the specific requirements of individual markets, and in some cases of individual regulatory authorities within those markets.⁹³

Third, the United States in particular has been very active, especially post-9/11, in enforcing its rules on not only U.S. financial institutions but also foreign financial institutions with operations in the United States. A

compiles a publicly available list of sanctioned individuals and entities associated with the Taliban, Al-Qaida, Osama bin Laden."); *Id.* at 3 ("targeted financial sanctions against individuals, involving the freezing of assets.").

⁹¹ For SWIFT's Financial Crime Compliance framework, see relevant materials at <https://www.swift.com/our-solutions/compliance-and-shared-services/financial-crime-compliance/about-compliance/document-centre>.

⁹² See Institute of International Finance, *supra* note 3, at 10.

⁹³ See *id.*

number of major financial institutions including HSBC, Standard Chartered, Barclays and BNP Paribas have been subjected to U.S. regulatory action for AML violations, sanctions violations, or both, resulting in large fines from U.S. federal and New York state regulators.⁹⁴ These actions against major financial institutions have typically resulted in deferred prosecution agreements, one requirement of which is typically the implementation of global systems of AML and sanctions compliance meeting US standards throughout the entire global operations of the firm.

Fourth, a core aspect of AML requirements is the reporting of suspicious transactions. Such requirements include both subjective elements (for instance unusual account behavior) as well as objective elements (e.g. reporting of any cash transaction over a certain size, often \$10,000).⁹⁵ The investigation and reporting process within a large financial institution is a major operation that requires significant resources, both human (at the moment) and IT.

This combination of factors has meant that AML and KYC has been a particular focus of RegTech spending and development within major financial institutions and in IT and advisory firms and start-ups, such that the majority of RegTech solutions to date have focused on KYC compliance.⁹⁶

2. Prudential regulatory reporting and stress testing

The general features underlying the rapid development of RegTech in the AML and KYC context also underpin the development of RegTech in the prudential regulatory reporting and stress testing context.

Like AML and KYC requirements, prudential regulatory reporting requirements were a major feature of financial regulation and compliance prior to the GFC. These were typically embedded in capital and trading reporting requirements.⁹⁷ While trading reporting requirements primarily focused on exchange traded activities and were designed to address issues of market conduct (in particular market manipulation and insider trading), capital requirements focused on the prudential safety and soundness of the individual financial institution.⁹⁸

⁹⁴ See, e.g., Martin Arnold & Sam Fleming, *Regulation: Banks Count the Risks and Rewards - Crackdown on Money Laundering Threatens to Leave Parts of Developing World Cut Off from Global Finance*, FIN. TIMES (Nov. 14, 2014), <https://www.ft.com/content/9df378a2-66bb-11e4-91ab-00144feabdc0>.

⁹⁵ FAFTA, *Anti-Money Laundering and Terrorist Financing Measures and Financial Inclusion*, 5-6, 40-41 (Feb. 2013); available at http://www.fatf-gafi.org/media/fatf/documents/reports/AML_CFT_Measures_and_Financial_Inclusion_2013.pdf.

⁹⁶ See Paymann, *Fintech Companies in Fraud Prevention, KYC and Security*, FinTech Valley (Sept. 28, 2015), <https://fintechvalley.org/2015/09/28/fintech-companies-in-fraud-prevention-kyc-and-security/>.

⁹⁷ See Institute of International Finance, *supra* note 3, at 6-9, 11.

⁹⁸ See Edward v. Murphy, *Who Regulates Whom and How? An Overview of U.S. Financial*

Capital requirements have been a major focus of cross-border regulatory cooperation since the 1980s, when the original Basel I Capital Accord was developed in response to insufficient levels of capital in internationally active financial institutions after the 1980s Developing Country Debt Crisis.⁹⁹ While initially fairly simple, throughout the 1990s Basel I was subject to a series of amendments which steadily increased its complexity and related compliance costs.¹⁰⁰ Of these, the amendments to extend the framework from credit risk to market risk and to recognize netting in derivatives contracts were probably the most significant, with the former's use of internal models forming an important element of Basel II.

Basel II, developed in the aftermath of the 1997 Asian Financial Crisis, was designed to bring together regulatory, economic and accounting capital into a single state-of-the-art market friendly framework.¹⁰¹ This reflected the consensus view of the reliability of quantitative financial risk management systems (despite some evidence to the contrary provided by the rescue of LTCM in 1999). Basel II thus extended the internal models-based approach, initiated by the Basel I Market Risk Amendment in 1995, to all aspects of capital regulation.¹⁰² Effectively, financial regulators outsourced the setting of capital requirements to large financial institutions themselves.

Following the GFC, attention has focused on the development of Basel III, designed to dramatically increase capital (particularly equity capital), reduce leverage, enhance liquidity, and implement systems of crisis management for individual institutions, including by limiting reliance on firms' own internal risk modeling systems.¹⁰³ This is a massive framework in its internationally agreed soft law form, and it will be even more substantial when implemented in the legal and regulatory systems of

Regulation Policy for Banking and Securities Market, Congressional Research Service 1, 16 (Jan. 30, 2015), <https://fas.org/sfp/crs/misc/R43087.pdf>.

⁹⁹ Christopher Alessi, *The Basel Committee on Banking Supervision*, Council on Foreign Relations, (July 11, 2012), <http://www.cfr.org/banks-and-banking/basel-committee-banking-supervision/p28694>. (referring to Daniel Tarullo, *Banking on Basel: The Future of International Financial Regulation* (2008)); Smitha Francis, *The Revised Basel Capital Accord: The Logic, Content and Potential Impact for Developing Countries* (Working Paper No. 09, 2006).

¹⁰⁰ See Andrew G. Haldane, Exe. Dir., Fin. Stability, Bank of England, & Vasileios Madouros, Econ., Bank of England, *The Dog and The Frisbee*, Bank of Int' Settlement, 1, 6–8 (Aug. 31, 2012), <http://www.bis.org/review/r120905a.pdf>. (Explaining how the “Tower of Basel” gets extremely complex and “thicker” from only 30 pages long to at least a 616 page-long accord document).

¹⁰¹ Francis, *supra* note 99.

¹⁰² See BIS, *An International Model-Based Approach to Market Risk Capital Requirements* (April 1995).

¹⁰³ In December 2010, the BCBS published the Basel III documents “Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems” (a revised version was published in June 2011) and “Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring” (a revised version was published in January 2013). The term “Basel III” basically means the regulatory structure and standards set forth by these documents. For a clear and comprehensive summary of Basel III, see ACCENTURE, *BASEL III HANDBOOK* (2010).

individual jurisdictions.

As with AML, prudential regulation requires global institutions to understand, monitor and report all aspects of their activities to regulators in the jurisdictions in which they operate. These requirements continue to multiply, with daily reporting of thousands of data points to multiple regulators in different jurisdictions now being the norm for a large, internationally active bank.¹⁰⁴ Such requirements mean that financial institutions have to be able to produce the necessary data at the required frequency in the form required by each individual regulator. While the overall approaches may be harmonized, the details frequently are not.¹⁰⁵ Development of significant compliance teams and IT systems to implement these requirements has thus been a major focus since 2008, with continual evolution of requirements as each stage of the G20/FSB reforms are agreed and implemented in individual jurisdictions.

Unlike the situation pre-crisis, regulators no longer rely on the internal risk management systems of individual financial institutions to produce appropriate levels of capital for economic, regulatory and accounting purposes, but instead have established complex rules to set capital, leverage, and liquidity at levels sufficient to protect financial stability, all backed up with periodic reviews and “stress tests.”¹⁰⁶ These changes have increased the demand for RegTech solutions for the financial industry.

As we argue in this Part, these regulatory requirements also necessitate the ever-increasing application of technology by regulators in order to monitor the rivers of data being sent to them. All this demand for RegTech solutions is providing opportunities for established advisory and technology firms as well as start-ups.

C. RegTech: A FinTech Opportunity

In addition to regulatory factors, RegTech is also being driven by FinTech developments. Examples include:¹⁰⁷

¹⁰⁴ See generally, Deloitte, Forward Look: Top Regulatory Trends for 2016 in Banking 1, 9 (2015), <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/finance/us-outlooks-top-regulatory-trends-for-2016-in-banking-reg.PDF>.

¹⁰⁵ This is probably the reason that some private sector standards promoters, such as ISO and the IIF, call for data standardization and definition harmonization. See Institute of International Finance, *supra* note 3, at 10.

¹⁰⁶ See e.g., OFFICE OF THE COMPTROLLER OF THE CURRENCY, BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM & FEDERAL DEPOSIT INSURANCE CORPORATION, REGULATORY CAPITAL RULES: REGULATORY CAPITAL, IMPLEMENTATION OF BASEL III, MINIMUM REGULATORY CAPITAL RATIOS, CAPITAL ADEQUACY, TRANSITION PROVISIONS, AND PROMPT CORRECTIVE ACTION (2012).

¹⁰⁷ See Chappuis Halder & Co., *FCA – RegTech: Call for Input: Supporting the Development and Adoption of RegTech* 12 (Jan. 2016), <http://www.slideshare.net/NicolasHeguy/chco-supporting-the-development-and-adoption-of-regtech>.

- **AML and KYC requirements.** AML and KYC requirements established by the FATF and the Basel Committee and implemented by domestic regulators around the world have been a driving force in the demand for RegTech solutions, in particular for technology to simplify and automate processes across the firm and to ensure compliance with applicable rules around the world, including suspicious transaction identification and reporting.¹⁰⁸ An increasing range of IT firms, advisory firms, and start-ups are involved, with clear opportunities for future development.

- **Reporting and data submission framework (e.g. Basel III, Dodd-Frank).**¹⁰⁹ As noted above, postcrisis regulatory changes have dramatically increased financial industry reporting requirements, particularly for large financial institutions. A key aspect of financial institution RegTech involves building strategic platforms to aggregate all the data needed to comply with stress testing requirements. At a more advanced level, there is an opportunity for both established institutions and start-ups to provide near real-time data analysis and customized reporting.

- **Capital assessment and Stress testing (CCAR, AQR).**¹¹⁰ In addition to reporting requirements, capital requirements and related stress testing emerging from postcrisis reforms are major drivers of RegTech in the financial industry. Advanced analytics capabilities can be used to design models and evaluate how thousands of variables impact financial institutions.

- **Trading book risk management (Volcker, MiFID).**¹¹¹ New regulations addressing trading have added complexity to the compliance requirements of global firms, particularly those facing different requirements in different jurisdictions. Algorithms can control the margin requirements for each transaction and manage the market risk of traders' portfolios.

Clearly, we are still at a fairly early stage in this process, but its evolution is developing rapidly.

D. Looking Forward: Shared Services Utility and Global

¹⁰⁸ The Basel Committee on Banking Supervision mainly promotes the implementation of AML and CFT standards through issuing guidelines. BASEL COMM' ON BANKING SUPERVISION, SOUND MANAGEMENT OF RISKS RELATED TO MONEY LAUNDERING AND FINANCING OF TERRORISM (2016).

¹⁰⁹ See International Institute of Finance, *supra* note 3, at 6–8.

¹¹⁰ See *id.* at 8–9.

¹¹¹ See *id.* at 11.

Compliance

In 2014, Goldman Sachs broke ground on a new campus in Bangalore (Bengaluru), India, with capacity for 9,000 staff.¹¹² Bangalore is already Goldman's second largest office (with approximately 6,000 staff, compared to 12,000 in New York). Other major financial institutions, including JP Morgan, Citibank, Morgan Stanley, Barclays, Deutsche Bank, HSBC, and Standard Chartered, among others, have large proportions of their staff in centralized support operations in India, especially in Bangalore, Mumbai, New Delhi, and Chennai. These are no longer primarily traditional back offices or call center operations but rather are increasingly focused on integrated global risk management and regulatory compliance. For instance, in the context of customer on-boarding, account opening, and KYC operations, these functions may be centralized in India (or elsewhere) for the entire operations of a global financial services firm.¹¹³

Likewise, in the context of the extensive reporting requirements of prudential regulators around the world, particularly resulting from postcrisis reforms, financial institutions now look to centralized operations to gather the necessary data globally on a real-time basis so that, in the first instance, the institution and its management has a much clearer picture of operations and risks, and in the second instance, so that the information can be repackaged as necessary to meet the requirements of regulators around the world.¹¹⁴ Ironically, these operations look a great deal like pre-2008 trading floors, with rows of desks with telephones and multiple screens to allow continuous monitoring and communication across the institution.

From a regulatory standpoint, these operations are interesting: generally, they are separately incorporated subsidiaries and are not regulated as banks in their host jurisdiction, as they are not conducting "banking" activities requiring licensing and regulation. Rather, they are often subject to the domestic outsourcing rules of the jurisdictions of the group entities for which they provide support.¹¹⁵

The result is the emergence of an entirely different way of addressing compliance, one driven by technology and regulatory change and comprising the most sophisticated level of RegTech today, what one could call the first element of a new postcrisis RegTech 2.0. From this it should be clear that the

¹¹² See *Goldman Sachs to Invest Rs 1,200 Crore in Bangalore*, THE TIMES OF INDIA (Sep. 25, 2014), <http://timesofindia.indiatimes.com/business/india-business/Goldman-Sachs-to-invest-Rs-1200-crore-in-Bangalore/articleshow/43383998.cms>.

¹¹³ See BEARING POINT, SURVEY: SHARED SERVICES INDUSTRY SPECIFICS AND TRENDS IN THE EUROPEAN FS MARKET 7–10 (2011).

¹¹⁴ See EY, CENTRALIZED OPERATIONS - THE FUTURE OF OPERATING MODELS FOR RISK, CONTROL AND COMPLIANCE FUNCTIONS (2014).

¹¹⁵ For a summary of the regulatory issues concerned with shared services, see DELOITTE, SHARED SERVICES HANDBOOK: HIT THE ROAD (2011).

increasing prevalence of RegTech in industry requires regulators to adapt and adopt technology within their own internal processes, which comprises the second element of postcrisis RegTech 2.0 and is the subject of Part IV.

IV. REGULATORS: COPING WITH COMPLIANCE

The common view is that regulators are under-resourced in terms of human capital and budgets, especially when it comes to acquiring and implementing technology. While as a general proposition this is almost certainly true and one of the main barriers to the development of RegTech within the regulatory community (and particularly in the context of developing countries), regulators have had some notable successes in the context of technology and regulation.¹¹⁶

It is certain, however, that relative to the private sector there has been a lag in regulator adoption of RegTech. Nonetheless, it is worth noting that large market incidents have prompted regulatory (re)action. In particular, regulators have actively used technology since the 1980s to monitor and enforce market integrity in exchange traded securities markets, with the U.S. Securities and Exchange Commission (SEC) providing the global lead.¹¹⁷ In addition, as discussed in Part III, regulators and the financial industry have long worked closely in the evolution of robust technological and regulatory solutions to issues regarding cross-border electronic payment systems as well as securities trading and settlement systems. However, with the rapidly growing amount of information reported to regulators and new technology such as AI and deep learning, there seems to be great potential for more to be done in terms of automating market supervision, consumer protection, and prudential regulation.¹¹⁸ In addition, regulators are being challenged by the pace of FinTech innovation, with this challenge being particularly acute in developing countries.

A. RegTech: A Regulator's Tool for the Twenty-First Century

The evolution of RegTech in the financial industry discussed in Part III, particularly RegTech developed by large global financial institutions and infrastructure providers such as payment systems, securities exchanges, and

¹¹⁶ We can observe this from the perspective of how technology changes and impacts the exercise of regulatory supervision and oversight in the field of securities regulation. Chris Brummer, *Disruptive Technology and Securities Regulation*, 84 FORDHAM L. REV. 977 (2015).

¹¹⁷ See, e.g., SEC, REPORT TO THE CONGRESS: THE IMPACT OF RECENT TECHNOLOGICAL ADVANCES ON THE SECURITIES MARKETS (1997); see also TECH. COMM. OF THE INT'L ORG. OF SEC. COMM'N, REGULATORY ISSUES RAISED BY THE IMPACT OF TECHNOLOGICAL CHANGES ON MARKET INTEGRITY AND EFFICIENCY (2011) (providing an overview of the major movements the SEC has led in regulation).

¹¹⁸ See Maryam M. Najafabadi et al., *Deep Learning Applications and Challenges in Big Data Analytics*, 2 J. BIG DATA 1 (2015).

clearing and settlement systems, highlights the rate of change within the industry itself. However, the regulators themselves provide an example of the gap between IT-enabled systems in the industry and the lack of IT-enabled solutions among regulators. This gap, now quite wide, is one regulators are beginning to become increasingly aware of due to the simple necessity of dealing with the masses of reports and data that post-GFC regulatory changes have required industry to deliver to them.¹¹⁹ Given that these data streams are designed to ensure financial stability and market integrity, it is essential for regulators to develop systems to appropriately monitor and analyze these regulatory datasets.

B. Big Data: Matching Reporting with Analytical Tools

AML and KYC has so far provided one of the most fertile areas for the development of RegTech in the financial services industry in the postcrisis period.¹²⁰ However, the information being produced by the financial services industry (particularly suspicious transactions reports) provides an example of an area where regulators are beginning to consider technological solutions to assist in monitoring and analysis and one where failure to do so would in fact largely defeat the intended regulatory objectives.

Failure by regulators to develop the IT capabilities to use the data provided in response to reporting requirements would severely impact the achievement of the policy objectives of such reporting requirements.¹²¹ This also provides an important opportunity for collaboration between regulators and academia (particularly quantitative finance and economics academics who have highly developed capabilities in analyzing datasets and a constant hunger for new datasets to analyze). Such collaboration offers great potential benefit to regulators and academics in supporting financial stability, market integrity, and a greater understanding of market behavior and dynamics.¹²²

¹¹⁹ For example, the UK Government Office of Science has acknowledged that “[a]t a time when institutions are asked to provide unprecedented quantities of data, there remains doubt about the regulators’ ability to measure risk and use such risk measurements in determining prudential regulatory regimes. This doubt is understandable, as much of recent prudential regulation has been designed and implemented in a constrained period of time, yet addresses complicated and evolving problems such as systemic risk measurement.” UK GOV’T CHIEF SCI. ADVISER, FIN TECH FUTURES - THE UK AS A WORLD LEADER IN FINANCIAL TECHNOLOGIES 48 (Mar. 2015), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/413095/gs-15-3-fintech-futures.pdf.

¹²⁰ To the extent that KYC is to RegTech what P2P was to FinTech: an immediately relatable posterchild.

¹²¹ Ravi Kalakota, *RegTech – Regulatory/Risk Data Management, AML, and KYC Analytics*, PRACTICAL ANALYTICS (Jan. 17, 2013), <https://practicalanalytics.co/2013/01/17/data-management-aml-and-kyc-analytics/>; see also KPMG, TEN KEY REGULATORY CHALLENGES FACING THE BANKING & CAPITAL MARKETS INDUSTRY IN 2016 2 (2015).

¹²² Such collaboration among regulators, academia and businesses has also been highlighted in the FinTech Report by the UK Government Chief Scientific Adviser. See UK GOV’T CHIEF SCI. ADVISER, *supra* note 119, at 52.

An area where regulators have been successful in using technology to monitor and analyze markets over the past twenty years is in reporting of transactions in public securities markets. Today, regulators rely heavily on the trade reporting systems of securities exchanges to detect unusual behavior which can serve as a trigger for further analysis and potential regulatory investigation and enforcement;¹²³ for instance, trading on inside information in advance of a major corporate event, such as a merger or acquisition. Securities exchanges maintain data on all trades so it is a simple matter to review trading activity prior to an announcement of a merger or acquisition to look for unusual trading activity. Such activity is then investigated for possible misconduct, which if indicated may form the basis of an enforcement action. Such systems provide an excellent example of RegTech 1.0 in the precrisis period.

Since the GFC, such systems have been shown to be limited by their lack of information on activities taking place off the exchanges. This is a clear concern given that the majority of trading in many major securities markets now takes place off-exchange via Electronic Communication Networks (ECNs) and “dark pools.”¹²⁴ Regulatory changes in the United States and EU are set to change this by mandating reporting of all transactions in listed securities, whether or not those transactions take place via a formal exchange or an off-exchange electronic system. Such reporting requirements must likewise be matched with IT systems within regulators themselves to monitor and analyze information presented.

This is the approach regulators must apply across their regulatory roles. This is the second element of an emerging RegTech 2.0. We argue however that it is necessary to move beyond this level and to develop a new approach.

C. Cybersecurity

The question of cybersecurity in finance highlights the necessity of further regulatory development.¹²⁵ In particular, the digital transformation of finance (the FinTech process) has made the industry far more vulnerable to attack. Indeed, as the financial services industry continues to evolve into a digitized data-based industry, there is an increasing risk of attack, theft, and fraud from hackers (and other cybercriminal activity). The 2016 Bangladesh central bank heist, implemented via SWIFT, has shown the vulnerabilities of existing frameworks, with the recent Yahoo hack providing further evidence of the potential risks.

Likewise, the 2008 GFC highlighted the public good and public order

¹²³ THE BD. OF THE INT’L ORG. OF SEC. COMM’N, TECHNOLOGICAL CHALLENGES TO EFFECTIVE MARKET SURVEILLANCE ISSUES AND REGULATORY TOOLS: CONSULTATION REPORT 14–15 (2012).

¹²⁴ Commissioner Luis A. Aguilar, *Shedding Light on Dark Pools*, S.E.C. (Nov. 18, 2015), http://www.sec.gov/news/statement/shedding-light-on-dark-pools.html#_edn5.

¹²⁵ See FIN. STABILITY OVERSIGHT COUNCIL, FSO 2016 ANNUAL REPORT (2016).

role of the financial sector, so that the financial sector and financial stability are not only economic issues but also national security issues.

Not surprisingly, this is an area of focus for regulators and one increasingly at the center of international attention from organizations such as the FSB and Basel Committee.¹²⁶ This is in addition to the very natural attention placed on the issue by financial institutions themselves: cybersecurity is one of the most significant risks faced by the financial industry, particularly as the digitization and centralization of processes continues.¹²⁷ Likewise for new FinTech start-ups, cybersecurity should be a key concern as these data intensive companies often have a limited comprehension or perceived need of security as they live in a digital world with an abundance of data. Whilst money has scarcity, which drove the development of secure vaults and payment systems, data abundance may not create the right incentive for firms (beyond reputation risks) and can clearly harm consumers.

Cybersecurity is thus the clearest example of how FinTech demands RegTech. However, the area with perhaps the greatest potential for RegTech is macroprudential policy.

D. Macroprudential Policy

Prior to the GFC, the focus of prudential and financial stability regulation was very much on the safety and soundness of individual financial institutions, particularly banks. This was premised on the idea that if each individual bank was financially safe and sound, then the financial system as a whole would likewise be stable. The GFC fundamentally altered this view, and since 2008, there has been a new focus on macroprudential policy, with the G20 tasking the IMF, FSB, and BIS to focus on the development of related early warning systems to prevent the build-up of risks that lead to financial crises, with the overall intention, whenever possible, to prevent crises from happening (or at the least minimize their severity). Macroprudential policy focuses on the stability of the entire financial system, based on a holistic analysis and focusing on interconnections and evolution over time.¹²⁸

As a result of this new focus, an increasing number of jurisdictions have implemented new institutional frameworks to support macroprudential policy, including the Financial Stability Oversight Council (FSOC) in the United States and the European Systemic Risk Board (ESRB) in the EU.

¹²⁶ See, e.g., THE BD. OF THE INT'L ORG. OF SEC. COMM'N, CYBER SECURITY IN SECURITIES MARKETS – AN INTERNATIONAL PERSPECTIVE (2016).

¹²⁷ See Sarah Dahlgren, *The Importance of Addressing Cybersecurity Risks in the Financial Sector*, FEDERAL RESERVE BANK OF NEW YORK (March 24, 2015), <https://www.newyorkfed.org/newsevents/speeches/2015/dah150324>.

¹²⁸ See IMF ET AL., ELEMENTS OF EFFECTIVE MACROPRUDENTIAL POLICY (2016).

These new institutional frameworks have been tasked, along with the IMF, FSB, and BIS, to seek to develop and implement macroprudential policies to prevent financial crises and support financial stability. Macroprudential policy thus seeks to use the massive amounts of data being reported to regulators in order to identify patterns and reduce the severity of the financial cycle.

This process however is proving challenging. Nonetheless, some progress is being made in identifying potential leading indicators for future financial instability.¹²⁹ The progress to date involves quantitative analysis of large volumes of data searching for interconnections and implications. The massive amounts of data being reported by financial institutions and financial infrastructure providers around the world is providing an ever increasing volume of data of ever-increasing forms which can feed into these analytical processes. Already, major central banks such as the Federal Reserve, the European Central Bank and the Bank of England are beginning to use data “heat maps” to highlight potential issues arising from automated analyses of the masses of daily and other data (such as stress tests) being produced by the financial services industry.¹³⁰

While these efforts remain at an early stage, they do highlight the likely future direction of RegTech in the area of macroprudential policy. At the same time, as a result of the process of analysis, regulators are continually identifying needs for yet more data.¹³¹ This results in ever increasing reporting requirements for financial institutions, further driving the need for RegTech processes and the necessity of centralized support services to collect and produce the required data at the required frequency and in the required format. In particular, the Basel Committee (in the so-called BCBS 239) has set requirements for risk data aggregation and reporting which, as they are implemented around the world, are driving internal processes in both financial institutions and regulators, with an increasing focus on near real-time delivery, with near real-time analysis hoped to follow.¹³² Significantly, the FSB and IMF have identified the need for harmonization of reporting templates for systemically important financial institutions in order to make analysis of data collected more straightforward.¹³³

While these are very important developments and show the first steps

¹²⁹ *Id.*; see COMM’ ON THE GLOB. FIN. SYS., EXPERIENCES WITH THE EX ANTE APPRAISAL OF MACROPRUDENTIAL INSTRUMENTS (2016); BLAISE GADANECZ & KAUSHIK JAYARAM, MACROPRUDENTIAL POLICY FRAMEWORKS, INSTRUMENTS AND INDICATORS: A REVIEW (2015).

¹³⁰ See IMF ET AL., *supra* note 128.

¹³¹ See FIN. STABILITY BD. & IMF, THE FINANCIAL CRISIS AND INFORMATION GAPS: SECOND PHASE OF THE G-20 DATA GAPS INITIATIVE (DGI-2) – FIRST PROGRESS REPORT (2016).

¹³² BASEL COMM., PRINCIPLES FOR EFFECTIVE RISK DATA AGGREGATION AND RISK REPORTING (2013). With thanks to Kevin Nixon of KPMG and formerly of the Institute of International Finance for this point.

¹³³ *Id.*

on the way to better regulation through technology, they highlight the challenges for other regulators in terms of expertise, access to technology, and financial constraints. They also set the stage for the application of more sophisticated big data tools including deep learning and AI.

V. FINTECH REQUIRES REGTECH

Building on the framework of analysis introduced in Part II establishing a working definition of RegTech, Parts III and IV have shown that regulators relied on the market penetration of technology to promote the development of DFS in developing countries and worked with industry participants to support development of financial infrastructure and related regulatory tools. More recently, policy makers and regulators are focusing attention on areas such as cybersecurity and macroprudential policy, highlighting the potential for far greater progress in coming years.

A. Re-inventing Financial Regulation

Based on the preceding analysis, the focus of RegTech going forward needs to shift away from the efficiency gains it has provided to date and look instead to RegTech's potential as a transformative tool to revolutionize financial regulation. Indeed, the speed of FinTech innovation, combined with the dramatic progress witnessed in some developing countries, warrants not only that RegTech be used to make financial regulation more effective and affordable, but also that RegTech be used to reconceptualize and redesign financial regulation in line with the transformation of financial market infrastructure.¹³⁴

As FinTech gradually moves from digitization of money to embrace the monetization of data, the regulatory framework for finance will need to be rethought so as to cover notions previously unnecessary such as data sovereignty and algorithm supervision. At this stage, the sustainable development of FinTech will need to be built around a new framework, namely RegTech. Doing so will require a sequenced approach.

First there is the need for a holistic approach that focuses on building twenty-first century infrastructure to support market functions. This is most clear in the context of SWIFT, with efforts now focusing on developing an improved structure to support global payments. On the technological side, blockchain may offer the potential to replace the clearing and settlement methods devised in the nineteenth century.¹³⁵ In the context of emerging markets, India's recent introduction of a multilevel strategy to support FinTech evolution and innovation broadly shows one very promising

¹³⁴ See WORLD ECON. FORUM, THE FUTURE OF FINANCIAL INFRASTRUCTURE (2016).

¹³⁵ ACCENTURE, BLOCKCHAIN TECHNOLOGY: PREPARING FOR CHANGE (2015).

example of how RegTech 3.0 could look.

Second is the challenge of developing appropriate regulatory responses to FinTech innovation. This is a core aspect of RegTech 3.0 that has been a major challenge for regulators around the world to date and that we have discussed previously.¹³⁶ One group of participants (often from the tech side) have argued for a laissez-faire approach, so as first to allow FinTech to grow and then, only once it has developed, to put in place regulation.¹³⁷ In many ways, this was China's approach until 2015. Because of a number of negative experiences, since the middle of 2015, China has instead focused on implementing a complete regulatory framework for FinTech.¹³⁸ The traditional financial services industry, arguably fearful of competition from new entrants unhindered by complex and expensive regulatory and compliance requirements, typically argues in favor of similar treatment for all.

In our view, the key is to balance risk and potential innovation by working closely to understand industry developments but at the same time making sure that similar activities are regulated in similar ways in order to protect against regulatory arbitrage.¹³⁹ Regulatory arbitrage, in particular moving activities to unregulated environments to avoid regulatory scrutiny, together with excessive reliance on financial institutions' internal quantitative risk management systems, were two of the major underlying factors in the 2008 GFC.¹⁴⁰ This idea of regulatory arbitrage underlies the postcrisis focus on addressing risks of shadow banking.

At the same time, there should be a multilevel approach which applies graduated regulatory requirements to firms based upon their level of risk and size. FinTech experience in the past decade (particularly in Africa and China) highlights the challenge of speed of development and the potential to move from "too small to care" to "too big to fail" (systemically important) in very

¹³⁶ Amer, Barberis & Buckley, *supra* note 2; Zhou, Amer & Buckley, *supra* note 49.

¹³⁷ See, e.g., *FinTech Regulation in China, Hong Kong, and Singapore*, NORTON ROSE FULBRIGHT (May 10, 2016), <http://www.nortonrosefulbright.com/knowledge/publications/139380/fintech-regulation-in-china-hong-kong-and-singapore>; Deborah Ralston, *Let's Not Regulate Away the Competition Fintech Can Bring*, THE CONVERSATION (Aug. 6, 2015), <https://theconversation.com/lets-not-regulate-away-the-competition-fintech-can-bring-45496>.

¹³⁸ Andrew Meola, *China Just Hinted It Could Increase Fintech Regulation*, BUSINESS INSIDER (June 29, 2016), <http://www.businessinsider.com/china-just-hinted-it-could-increase-fintech-regulation-2016-6/?r=AU&IR=T>.

¹³⁹ The G-20 in its recently approved High-Level Principles for Digital Financial Inclusion also calls for the promotion of an "Enabling and Proportionate Legal and Regulatory Framework" that "ensure[s] that similar risks are regulated in a similar manner and that an appropriate risk-based approach to supervision is developed." GLOB. P'SHIP FOR FIN. INCLUSION, G20 HIGH-LEVEL PRINCIPLES FOR DIGITAL FINANCIAL INCLUSION (2016).

¹⁴⁰ See also U.S. FIN. CRISIS INQUIRY COMM'N, THE FINANCIAL CRISIS INQUIRY REPORT - FINAL REPORT OF THE NATIONAL COMMISSION ON THE CAUSES OF THE FINANCIAL AND ECONOMIC CRISIS IN THE UNITED STATES (2011).

short periods of time.¹⁴¹ In fact, it is this that has caused the reevaluation of regulatory approaches in China.¹⁴² This also highlights the necessity of monitoring of new developments across the financial system by regulators, in order to both understand what is happening and its potential implications. At the international level, this is now taking place through the FSB in conjunction with the IMF and BIS, in an effort to identify and raise awareness of new developments that may quickly arise in other markets.¹⁴³

Third, we will consider regulatory sandboxes. These have been a central focus in the context of appropriate regulation of FinTech. From our perspective, perhaps the greatest potential for the sandbox tool is in the context of the evolution of RegTech, through the opportunity they present for the testing of new approaches by industry and regulators.

B. From KYC to KYD: Changing Regulation Byte by Byte

From a technological standpoint, the development of RegTech is not a major challenge.¹⁴⁴ The primary limitation may instead come from the regulators' own ability to handle and process the increased amount of data generated through technology.¹⁴⁵ The UK FCA seems cognizant of this fact as it is currently controlling access to its regulatory sandbox to a limited number of applicants with a detailed testing plan.¹⁴⁶ As a result, there needs to be a coordinated approach by financial regulators to support the development of RegTech. Harmonization of financial markets and regulations has a long history, and harmonization seems increasingly important given the mobility of new FinTech start-ups. Furthermore, in the context of the UK, lack of harmonization within the EU prevents the complete development of regulatory sandboxes.¹⁴⁷

In the UK, the Blackett report has proposed a methodology to favor harmonization of data-driven regulation and compliance models, which would entail:¹⁴⁸

¹⁴¹ Arner, Barberis & Buckley, *supra* note 2.

¹⁴² Zhou, Arner & Buckley, *supra* note 49.

¹⁴³ See Huw Jones, *Global Regulators Move Closer to Regulating Fintech*, REUTERS (March 31, 2016), <http://www.reuters.com/article/us-g20-regulations-fintech-idUSKCN0WX21J>.

¹⁴⁴ See UK GOVERNMENT CHIEF SCIENTIFIC ADVISER, *supra* note 119, at 53.

¹⁴⁵ *Id.* at 48.

¹⁴⁶ This includes: test durations, key milestones, risk analysis, investigation of potential exposure, measurement metrics and exit strategy. For more details, refer to Andrew Moyle & Fiona Maclean, *World-First Regulatory Sandbox Open for Play in the UK*, LATHAM & WATKINS 1 (May 2016), <https://www.lw.com/thoughtLeadership/LW-world-first-regulatory-sandbox-open-for-play-in-UK>.

¹⁴⁷ There is even a current discussion on developing an EU-wide regulatory sandbox. See William Shaw, *EU Weighs Cross-Border Financial Regulatory Sandbox*, LAW360 (Sept. 16, 2016), <http://www.law360.com/articles/840834/eu-weighs-cross-border-financial-regulatory-sandbox>.

¹⁴⁸ See UK GOVERNMENT CHIEF SCIENTIFIC ADVISER, *supra* note 119, at 49.

- **Regulatory policy modelling:** emerging techniques such as agent-based modelling could be used to simulate the likely impact of new policies before enactment and the practical impact of existing regulation, including conflicts between regulators. Economic analysis of the impact of regulation has been an important trend since the Reagan administration in the United States and has increasingly been adopted by other jurisdictions, including the EU as well as at the international level through quantitative impact studies from the FSB, BIS, and Basel Committee. The result has been the necessity of the creation of economic analysis capabilities in regulatory agencies in order to produce the required reports. The U.S. SEC's Department of Economic Risk Analysis is one such example.
- **Reporting standards:** developing common compliance tagging and reporting standards across multiple jurisdictions could support calls for the mandatory sharing of information between regulators with overlapping jurisdictions. This is being discussed in the context of the G-20, FSB, and IMF Data Gaps Initiative in particular and would have the potential to reduce reporting challenges for major financial institutions and potentially provide better data to support macroprudential analysis.
- **Systemic risk tools:** encouraging the academic community to develop a range of mathematical techniques to assess risk has the potential to yield important tools for regulators. This process is at early stages, with increasing cooperation between major central banks and academics, but has much greater potential for development going forward.
- **Harmonization:** the integration of national, European, and global financial monitoring systems could be beneficial. Institutions are faced with varied regulatory demands across jurisdictions. Standardized and harmonized reporting could therefore be beneficial for both institutions and regulators. As highlighted above, this has now been proposed and supported by the FSB, IMF, and G-20 as part of the G-20 Data Gaps Initiative. Likewise, efforts are progressing in the context of OTC derivatives reporting and information sharing. The real challenge however remains in its implementation.
- **Uniform compliance tools:** because compliance is becoming increasingly analytical, the regulators might encourage the development of a suite of open source compliance tools (which in turn would provide an opportunity for FinTech and other financial services start-ups).
- **Collaborations and selected data sharing:** could be encouraged

between different international regulators, for example with respect to bad actors within the system. For instance, it would benefit UK regulators to know which UK banks are being investigated for bad practices in other markets. Another example where there is truly transformative potential is in the area of money laundering and KYC requirements. A global system of reporting and KYC available to participants (both regulators and industry) could transform AML efforts and related compliance costs as well as support financial inclusion, as highlighted in the ongoing G-20 and FSB focus on correspondent banking.

• **Regulators collaborate with FinTech:** to see what kinds of data are being collected and new ways of collecting data, e.g. logging location data alongside transaction data. Central banks in major jurisdictions in particular have the necessary resources to drive these sorts of collaborations, as do international financial institutions such as the World Bank and Asian Development Bank in the context of providing resources, financial and technical, to developing countries, which will face ever increasing challenges to their regulatory and technological capabilities as FinTech continues to transform finance.

This provides a framework of steps on an important path that regulators are now beginning to follow.

C. Building Twenty-First Century Financial Infrastructure

Looking forward, two examples highlight the sorts of RegTech 3.0 initiatives which may provide the potential to transform finance.

This first is the example of blockchain (distributed ledger and related technologies) and its use in clearing and settlement (as well as many other areas).¹⁴⁹ Amongst the most advanced discussions of blockchain is a discussion of its potential use in clearing and settlement of securities trades in exchange-traded and related environments (such as dark pools and ECNs).¹⁵⁰ The Australian Securities Exchange (ASX) and NASDAQ-OMX are both engaged in blockchain projects, of which NASDAQ's is more

¹⁴⁹ The G-20 High-Level Principles for Digital Financial Inclusion also encourage worldwide regulators to “[c]ollaborate with industry to explore the potential of distributed ledger technology [blockchain] to improve the transparency, efficiency, security, and reach of wholesale and retail financial infrastructure, allowing for appropriate risk mitigation and safeguards.” GPFI, G20 HIGH-LEVEL PRINCIPLES FOR DIGITAL FINANCIAL INCLUSION (2016).

¹⁵⁰ Goldman Sachs recently reported that the cash equities market could save US\$6 billion if blockchain technology were used. See *Blockchain Tech Could Save Cash Equities Market \$6bn a Year – Goldman Sachs*, FINEXTRA (May 26, 2016), <https://www.finextra.com/newsarticle/28955/blockchain-tech-could-save-cash-equities-market-6bn-a-year—goldman-sachs>.

advanced.¹⁵¹ In addition, major financial institutions are progressing with development of blockchain-based systems for clearing and settlement of foreign exchange transactions, potentially the next level of evolution of the long development of regulator and industry efforts to support the efficiency and stability of these largest and most global of markets. Finally, efforts are underway to develop blockchain systems to address requirements for OTC derivatives clearing and settlement, implemented in the wake of the 2008 crisis.¹⁵² Blockchain may also underpin efforts to redevelop SWIFT and similar systems.

Overall, each of these initiatives requires close collaboration between industry and regulators in order to be successful and each has the potential to greatly improve the functioning of markets and massively reduce costs.

A second example involves the so-called India Stack. India Stack is an idea originated by a group of Indian IT entrepreneurs and supported by the government and the Reserve Bank of India (RBI) that involves four main levels.¹⁵³ Together, the four levels are intended to provide the basis for a FinTech transformation of India's inefficient financial sector and broaden access to financial services across India's massive population, while at the same time opening the market to competition from entrepreneurs, start-ups and IT and ecommerce firms.

At the first level is a national system of biometric identification.¹⁵⁴ Identity is at the base of most financial sector access issues and is a challenge across all participants in finance. In India, addressing this has involved the creation of biometric national identification cards based on ten fingerprints and two retina scans. Such IDs have been issued to over one billion people since 2010.¹⁵⁵

At the second level is the establishment of bank accounts as part of the process of delivering national services such as pension, health and other welfare payments and transfers.¹⁵⁶ To date, over 200 million bank accounts

¹⁵¹ See James Eyers, *ASX Builds Blockchain for Australian Equities*, SYDNEY MORNING HERALD (Jan. 22, 2016), <http://www.smh.com.au/business/banking-and-finance/asx-builds-blockchain-for-australian-equities-20160121-gmbic0.html>; Michael del Castillo, *Nasdaq Opens Blockchain Services to Global Exchange Partners*, COINDESK (May 26, 2016), <http://www.coindesk.com/nasdaq-blockchain-services-global-exchange/>.

¹⁵² See *Blockchain Technology Will Profoundly Change the Derivatives Industry*, BITCOIN MAGAZINE (May 27, 2016), <https://bitcoinmagazine.com/articles/blockchain-technology-will-profoundly-change-the-derivatives-industry-1464368431>.

¹⁵³ Abhijit Bose, *India's Fintech Revolution is Primed to Put Banks out of Business*, TECHCRUNCH (June 14, 2016), <https://techcrunch.com/2016/06/14/indias-fintech-revolution-is-primed-to-put-banks-out-of-business/>. To learn more about India Stack, visit its official website at <http://www.indiastack.org/About-India-Stack>.

¹⁵⁴ *Id.*

¹⁵⁵ Press Release, Unique Identification Authority of India, *Indian National Identity Program Tops 1 Billion Enrollees* (May 2, 2016), <http://www.irisid.com/indian-national-identity-program-tops-one-billion-enrollees/>.

¹⁵⁶ Bose, *supra* note 153.

have been opened as part of this process, dramatically expanding access to the formal financial system.¹⁵⁷

At the third level is a common payment API to enable payments to be made by anyone through a common system supported by the RBI.¹⁵⁸

The fourth level involves a series of electronic KYC initiatives which allow individuals to maintain details of their financial affairs and to provide these details to financial services and other providers in order to meet KYC requirements.¹⁵⁹ These E-KYC utility platforms show how RegTech can improve integrity of financial markets and reduce counterparty risks.

The combination of these initiatives has arguably set the stage for a dramatic transformation of the Indian financial system, similar in scope and scale to that which has taken place in China but with a potentially very different resulting character. Looking forward, the development of new approaches in an environment conducive to testing and experimentation will be essential.¹⁶⁰ This too is emerging, in the form of regulatory sandboxes.

D. Regulatory Sandboxes: A Testing Environment for RegTech 3.0

Regulatory sandboxes represent a major element of new regulatory approaches. The principles of regulatory sandboxes can originally be found within the technology sector where a sandbox represents a virtual environment to test in isolation a new process or software. However, in the financial markets context, a better parallel may be with clinical trials, as the sector is similarly regulated to prevent consumer harm while testing new innovation.

This leading example to date comes from the UK. Announced by the UK FCA's Project Innovate Unit, a "regulatory sandbox" is expected to be a "safe space in which businesses can test innovative products, services, business models and delivery mechanisms without immediately incurring all the normal regulatory consequences on engaging in the activity of question."¹⁶¹ The UK has recently commenced its sandbox and there are already other jurisdictions (including Australia¹⁶², Singapore¹⁶³,

¹⁵⁷ *Id.*

¹⁵⁸ *Id.*

¹⁵⁹ *Id.*

¹⁶⁰ See CHRIS BRUMMER & DANIEL GORFINE, FINTECH: BUILDING A 21ST-CENTURY REGULATOR'S TOOLKIT, 6–11 (Oct. 2014).

¹⁶¹ FINANCIAL CONDUCT AUTHORITY, REGULATORY SANDBOX 4 (Nov. 2015).

¹⁶² Moyle & Maclean, *supra* note 146.

¹⁶³ See Media Release, Monetary Authority of Singapore, MAS Proposes a 'Regulatory Sandbox' for FinTech Experiments (June 2016), <http://www.mas.gov.sg/News-and-Publications/Media-Releases/2016/MAS-Proposes-a-Regulatory-Sandbox-for-FinTech-Experiments.aspx>.

Switzerland¹⁶⁴, Hong Kong¹⁶⁵, Thailand¹⁶⁶, Abu Dhabi¹⁶⁷ and Malaysia¹⁶⁸) that have expressed their intention to set up similar initiatives.

The FCA has established a framework of application as well as safeguards for the operation of its sandbox. The stated market objectives for the sandbox are to: (1) reduce time-to-market at a potentially lower cost; (2) provide better access to finance; and (3) foster more innovative products reaching the market.¹⁶⁹

The FCA has been exploring a series of options in terms of sandbox innovation. These include: (1) Virtual Sandbox, (2) Regulatory Sandbox, and (3) Sandbox Umbrella. The access to the sandbox is limited both in the scope of applicants and duration. Indeed, as it currently stands, the sandbox will be opened in phases,¹⁷⁰ and be reserved to participants which are able to demonstrate:

- **That the Firm falls within the right scope:** such that the planned new solution is designed to support the financial services industry.
- **Genuine Innovation:** such that the new solution is novel or significantly different to existing offerings.
- **Consumer Benefit:** such that the innovation offers a good prospect of identifiable benefit to consumers.¹⁷¹
- **Need for Sandbox:** such that the business in fact has a genuine need for testing within a sandbox framework.
- **Background Research:** such that the business has invested appropriate resources in developing the new solution, understanding the applicable regulations and mitigating the risks.

From a start-up perspective, regulatory sandbox access represents an opportunity to operate without complete licensing obligations. To do so, the

¹⁶⁴ See Press Release, FINMA, FINMA Reduces Obstacles to FinTech (Mar. 17, 2016), <https://www.finma.ch/en/news/2016/03/20160317-mm-fintech/>.

¹⁶⁵ See *Hong Kong Regulator to Launch Fintech 'Sandbox'*, THOMSON REUTERS (Sept. 5, 2016), <http://www.reuters.com/article/hongkong-banks-regulator-idUSH9N18001M>.

¹⁶⁶ See *Forming a Fintech Family*, BANGKOK POST, (Sept. 14, 2016), <http://www.bangkokpost.com/business/news/1085544/forming-a-fintech-family>.

¹⁶⁷ See Press Release, Abu Dhabi Global Market, Abu Dhabi Global Market Sets Out Proposal for Fintech Regulatory Framework in the UAE, Abu Dhabi Global Market (May 10, 2016).

¹⁶⁸ See BANK NEGARA MALAYSIA, REGULATORY SANDBOX: DISCUSSION PAPER (July 29, 2016).

¹⁶⁹ FINANCIAL CONDUCT AUTHORITY, *supra* note 161, at 5.

¹⁷⁰ The first cohort can apply to enter the sandbox between May 9, 2016 and July 8, 2016, and the second cohort is due to start in January 2017.

¹⁷¹ This criterion is due to be *continuously* met during the participation in the sandbox.

FCA will propose a number of options such as:¹⁷²

- **No enforcement action letter (NAL):** Stating that the FCA will not take enforcement actions against the testing activities where it is agreed that the firm does not breach the requirements or objectives of the FCA.
- **Individual Guidance Letter:** Provided that the firm's actions are within the guidance issued by the FCA, no enforcement actions will be taken against them.
- **Waivers:** "Where it is clear that testing activities do not meet our rules but the firm can meet the waiver test and the rules are within the FCA's power to waive, the FCA can waive or modify particular rules for sandbox firms."¹⁷³

However, the sandbox needs to uphold the regulators' mandates and particularly that of consumer protection. As a result, the FCA has made it clear that in the event that consumers (as opposed to anonymized data) are engaged in activities conducted within the sandbox, four different approaches are available to be adopted:¹⁷⁴

- **Approach 1:** As in clinical trials, sandbox firms can only test their new solutions on customers who have given fully informed consent to be included in testing. Customers have to be notified of potential risks and the available compensation.
- **Approach 2:** FCA agrees on a case-by-case basis the disclosure, protection and compensation approach for the testing activity.
- **Approach 3:** Customers should have the same rights as customers who engage with other authorised firms (e.g. to complain to the firm and then to the Financial Ombudsman Service (FOS), and have access to the financial services compensation scheme).
- **Approach 4:** Businesses undertaking sandbox trials are required to compensate any losses (including investment losses) to customers and must demonstrate that they have the resources (capital) to do that.

Furthermore, the FCA has also made clear that its ability to allow a firm to operate without the traditional licensing regime is subject to EU law

¹⁷² FINANCIAL CONDUCT AUTHORITY, *supra* note 161, at 9.

¹⁷³ *Id.*

¹⁷⁴ *Id.*

limitations.¹⁷⁵

Looking forward, such regulatory sandboxes are likely to be one of the best ways to support the future development of RegTech 3.0.

VI. RECONCEPTUALIZING FINANCIAL REGULATION

Whilst RegTech 2.0 is largely about streamlining and automating regulatory compliance and reporting, it is adapted to rules developed to suit a much different technological context than that which is evolving rapidly today. Going forward, RegTech 3.0 should be built in a forward-looking manner. Regulation is a product of its own history, and market context, current technological developments (such as blockchain) and emerging market developments (i.e. India Stack) are so fundamentally challenging the status quo that reconceptualization of regulation becomes necessary.

Part V set a potential conceptual framework for RegTech 3.0. It appears there is a progressive alignment underway in how FinTech and RegTech are evolving, both sharing data-centricity as a common denominator. This represents a paradigm shift from a KYC approach towards a KYD (Know-Your-Data) paradigm, which, while profound, remains a few years away. Until then, the design and implementation of proportionate and data-driven regulation should enable proactive regulators to handle innovation without compromising their mandate.

As one example, the UK government is seeking to promote the design of a regulatory framework able to dynamically adapt to new rules and regulations.¹⁷⁶ The argument for cost reduction within compliance is very strong, and RegTech looks particularly beneficial for firms and regulators alike. Indeed, RegTech should enable firms to better control risks and costs, and regulators to benefit from more efficient monitoring tools and from simulation systems to evaluate the consequences of future legislative reforms.

Yet, balance is needed in assessing what is currently feasible when it comes to fully automating regulatory and compliance systems.¹⁷⁷ Furthermore, the RegTech sector will continue to reinvent itself. While post-2008 regulatory requirements are still evolving, going forward we can expect the next financial crisis to add extra layers of requirements and companies that develop new business models, in turn generating unexpected risks. The legal academic literature would strongly benefit from engaging with what is currently being developed within data science and deep learning, in particular.

¹⁷⁵ *Id.* at 8.

¹⁷⁶ See UK GOVERNMENT CHIEF SCIENTIFIC ADVISER, *supra* note 119, at 47.

¹⁷⁷ VYTAUTAS CYRAS & REINHARD RIEDL, FORMULATING THE ENTERPRISE ARCHITECTURE COMPLIANCE PROBLEM (2009).

The principles behind regulatory sandboxes can be unbundled and enhanced by introducing the concepts of Minimum Regulatory Obligations (MRO), while Recovery and Resolution Plans (RRPs) should be adapted to fit start-ups.¹⁷⁸ The combination of these two models may resolve current deficiencies, moving the sandbox exercise away from its current pilot status to a system-wide framework able to nurture innovation in financial markets without distorting competition.

In this context, the emergence of the UK FCA's Project Innovate provides a useful example. The Project Innovate team was built on the back of the new banking landscape which aims to introduce competition and new banks in the UK.¹⁷⁹ This was only made possible by having proportionate regulatory capital demanded from new entrants, as well as the design of a resolution and recovery plan (RRP). In this way, the RRP concept combined with the MRO concept provides a basis for an appropriate way forward in the context of regulating new entrants.

Regulation and regulators may usefully extend the reasoning of RRP to start-ups by contemplating their failure. One example is the introduction of a deposit insurance scheme in China, to provide a safety net allowing for the potential failure of new banks.¹⁸⁰ In other words, market entry for new participants could be facilitated for those that have a clear exit strategy in case of failure due to internal or external factors.

In conclusion, this paper illustrates that for the past 50 years the application of technology within regulation has changed dramatically. The authors have defined the pre-2008 evolution as RegTech 1.0, a paradigm severely damaged by the 2008 GFC. Since 2008, the combination of new regulatory obligations and technology in the financial industry forms the first element of a new RegTech 2.0; the use of technology to facilitate and streamline compliance. The second element of RegTech 2.0, involving regulators using technology to improve their supervision and regulation, is emerging but still at an early stage.

Looking forward, the truly transformative potential of RegTech is for it to be used to re-conceptualize the future of financial regulation by leveraging on new technology, and we are beginning to see certain elements of this new RegTech 3.0 emerge, with technological progress changing both market

¹⁷⁸ This similarly requires a regulatory mindset shift, as we move from a too-big-to-fail paradigm, whereby risk and contagion are sought to be mitigated, to a "small-enough-to-fail" paradigm whereby failure is anticipated and planned for from the start. Start-ups are particularly suited for the development of RRP since over 90% of them will fail and their size makes the mapping of their risk (e.g. liquidity, market, reputation, technology, etc.) relatively easy given their simpler technological and corporate structures.

¹⁷⁹ *Project Innovate and Innovation Hub*, UK FINANCIAL CONDUCT AUTHORITY (May 11, 2015), <https://www.fca.org.uk/firms/project-innovate-innovation-hub>.

¹⁸⁰ Lingling Wei, *China to Begin Deposit Insurance in May*, WALL ST. J. (Mar. 31, 2015), <http://www.wsj.com/articles/china-to-begin-deposit-insurance-from-may-1427794649>.

participants and infrastructure, with data as the common denominator. The practical consequences of this shift would mean undergoing a transformation from a KYC mindset to a KYD approach. The opportunity is to move from travelling in an A380 to the Starship Enterprise. The A380 is a splendid aircraft, smooth, quiet, capacious and powerful. However, the A380 is only an incremental improvement in aeronautical design. The quantum improvement is the Starship Enterprise.

This is where the FinTech revolution is taking us. As our financial system moves beyond KYC to KYD we will move into an entirely new regulatory paradigm that will have to deal with everything from digital identity to data sovereignty and that will have the potential to extend far beyond the financial sphere.¹⁸¹

For regulators, this implies that data security and use will be more important than ever before for consumer protection, prudential regulation will focus on algorithm compliance, and financial stability will also be concerned with financial and information networks. The shift from RegTech 2.0 to RegTech 3.0 represents a market-wide reform which will need to be sequenced. The emergence of FinTech companies, combined with the wider use of regulatory sandboxes, offers a unique opportunity to pilot this novel kind of regulatory architecture that is proportionate, efficient and data-driven before market-wide implementation. FinTech requires RegTech. The challenge for regulators globally will be “to boldly go where no man has gone before” to conceptualize and implement the possibilities of RegTech.

¹⁸¹ See, e.g., WEF, A BLUEPRINT FOR DIGITAL IDENTITY - THE ROLE OF FINANCIAL INSTITUTIONS IN BUILDING DIGITAL IDENTITY (Aug. 2016).