UNSGSA

Early Lessons on Regulatory Innovations to Enable Inclusive FinTech:

Innovation Offices, Regulatory Sandboxes, and RegTech

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Foreword from the UNSGSA

When the new Global Findex data was released last year, I was so pleased to see that since 2014, 515 million more adults globally have gained access to the financial tools they need. As of 2018, a staggering 3.8 billion people—almost 70 percent of all adults—are now financially included. Yet, there is still much to do.

This new data also reveals the great power of innovative technologies to expand access to financial services—and, most importantly, ensure that people actually use these services to improve their lives. FinTech presents amazing opportunities to empower the unbanked to protect themselves against hardships and invest in their futures.

Last year when I visited Nigeria, I met a catfish seller, Flora Edojah, who was able to transform her simple market stall in Lagos into a thriving business with the support of Lidya—a leading FinTech company. Although she approached Lidya with no traditional collateral or credit history, the company was able to approve her loan quickly, with every step taking place online, by analyzing the digital footprint of her online supply purchases.

This is just one example that reveals how FinTech solutions can make products and business processes cheaper, faster, and more customer-centric by improving users' experiences. FinTech can also drive more competition and collaboration between traditional players, start-ups, and tech companies.

However, technology is a double-edged sword. Innovations can sometimes amplify threats to consumers, such as large-scale frauds, data privacy breaches, and cybersecurity risks. Technology can also leave behind unconnected and less digitally literate consumers. These new risks, speed, and complexity of FinTech can trigger regulatory overreactions that stifle innovation. At the same time, if these risks are left unaddressed, they can harm customers and threaten stability.

For many regulators in emerging and developing economies, creating the regulatory tools to keep up with the fast pace of innovation is extremely challenging—particularly in countries that lack resources and staff with the technology skills to understand FinTech's rapid development. This is why, in the past year, together with my FinTech Working Group,[1] we have decided to document and share early lessons learned on regulatory initiatives for FinTech with an emphasis on financial inclusion.

This report is designed to help regulators, especially from emerging and developing economies, as they consider their own approaches for regulating FinTech. It reviews early lessons learned on innovative regulatory initiatives such as regulatory sandboxes, innovation offices, and RegTech. It also contains a set of Implementation Considerations for regulating innovation.

This work would not have been possible without the support from my FinTech Working Group, the Monetary Authority of Singapore (MAS), and the great assistance of the Cambridge Centre for Alternative Finance, who led the writing of the report with the help of numerous reviewers.

Going forward, I am confident that together, we can tackle FinTech's challenges and seize its potential to transform people's lives for the better.

H.M. Queen Máxima of the Netherlands
United Nations Secretary-General's Special Advocate for Inclusive Finance for Development

1 UNSGSA FinTech Working Group is made up of members from AFI, Ant Financial, BFA, BMGF, BSP, BTCA, CGAP, IFC, MAS, McKinsey, Omidyar Network, PayPal, RBI, and the World Bank.

Foreword from the Monetary Authority of Singapore

Financial technology is transforming the way financial services are produced, distributed, and consumed. It has tremendous potential to improve peoples' lives. FinTech promotes financial inclusion, enhances customer experience, and enables delivery of financial services at lower costs and faster speeds, allowing providers to reach out to the unbanked and uninsured segments of the community.

This potential is especially relevant in Southeast Asia where more than half the adult population is unbanked. However, the region also has the third highest mobile penetration rate in the world, behind only China and India. With the power of a mobile phone in hand, millions of people in remote and rural parts of the region can now make payments, buy insurance, and apply for loans. Poor financial infrastructure and a lack of personal documentation or credit history are no longer barriers to financial inclusion.

Like all technologies, FinTech is not without risk. Financial regulators play an important role in ensuring the balance between promoting innovation and controlling risk, especially in emerging and developing economies.

The Monetary Authority of Singapore embarked on its FinTech journey just over three years ago, learning and experimenting along the way. We have introduced a number of innovations, some of which are covered in this report. The journey continues as we fine-tune our policies and strategies to adapt to new developments and constantly learn from the industry and our fellow regulators.

Those present at the MAS-UNSGSA roundtable in Singapore last year felt that regulators would benefit from a review of insights drawn from the different FinTech regulatory approaches being taken around the world. The FinTech Working Group of the UNSGSA and CCAF have done an excellent job in collating feedback from more than 40 regulators.

I hope this report will serve as a toolkit for all regulators as we progress along the FinTech journey and harness its potential for people.

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Managing Director
Monetary Authority of Singapore

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Finally, the Office of the UNSGSA and the CCAF research team would like to thank the regulators, policymakers, subject matter experts, and industry stakeholders who provided valuable insights into the innovative regulatory initiatives discussed in this report, primarily through interviews. A full list of interviewees can be found in Annex 1.

Executive Summary

Technology-enabled innovation in financial services (FinTech) has grown rapidly in the past decade. New technology-enabled financial services include mobile payments, peer-to-peer (P2P) lending, alternative credit scoring, and new forms of savings and insurance. If properly regulated, FinTech can extend the benefits of financial inclusion to millions of unbanked and underbanked people around the world.

Technology-enabled financial services are becoming increasingly sophisticated as they rapidly evolve and scale. The rise of FinTech presents many regulatory challenges—for emerging and developing economies in particular. Regulators with limited expertise in technology may find it difficult to understand FinTech and assess its implications for regulation. Regulators in emerging and developing economies typically have limited resources, and technology-led innovation adds additional pressure. Without an appropriate regulatory environment, inclusive financial innovation may be stifled and *financial exclusion* exacerbated.

A number of regulators in advanced, emerging, and developing economies have responded to such challenges by innovating on their own. These ***innovative regulatory initiatives*** include innovation offices, regulatory sandboxes, and RegTech for regulators. These types of initiatives encourage financial innovation that results in market improvements and financial inclusion.

INNOVATION OFFICES

Innovation offices are often the first step in the regulatory innovation journey, given their role in facilitating regulator–innovator engagement. They can improve understanding of technology-enabled financial innovation and support appropriate regulatory responses. They may reduce regulatory uncertainty and signal a pro-innovation stance, which, in turn, encourages inclusive FinTech.

Key lessons learned from innovation offices underscore the importance of early, and close, engagement with innovators. Executive buy-in and inter-agency coordination ensure their effective functioning, and they can be a powerful support to regulators with a financial inclusion remit. Eligibility criteria can help regulators prioritize engagement with providers deemed most critical to achieving the innovation office's established objectives. Finally, innovation offices are also only as good as the quality of their resources, such as the technical capacity of their staff.

REGULATORY SANDBOXES

Regulatory sandboxes have been widely adopted as an innovative regulatory initiative. At the core they are formal programs that test financial services and business models with actual customers, subject to certain safeguards and oversight. Several have been launched with the specific intent to foster market development that advances financial inclusion, including through thematic sandboxes. Sandboxes can help regulators gain a better understanding of FinTech and develop evidence-based regulations that promote inclusive FinTech.

Lessons learned from early regulatory sandboxes highlight that they are neither necessary nor sufficient for promoting financial inclusion. Sandboxes do offer benefits but are complex to set up and costly to run. Experience shows that most regulatory questions raised in connection with sandbox tests can be effectively resolved without a live testing environment. Similar results may be more affordably achieved through innovation offices and other tools.

While sandboxes may be an important tool for developing evidence-based policy, they should not distract regulators from pursuing other avenues and tools for engaging with market participants and adopting more fundamental regulatory enablers to advance financial inclusion. Where sandboxes are implemented, processes can be streamlined to reduce review and processing time. When FinTech innovations fall in the supervisory scope of multiple regulators, additional coordination is required.

REGTECH

RegTech (regulatory technology) is a distinct innovative regulatory initiative. While certain types of initiatives may help regulators determine which activities to include in their scope, RegTech focuses on how to monitor and enforce compliance against relevant regulations. RegTech can support a more responsible delivery of innovative financial services, which may directly impact financial inclusion. It also allows regulators to swiftly respond to market developments, better protect consumers, and enhance institutional supervision.

Currently there are limited examples of RegTech solutions being deployed in emerging and developing economies. Lessons learned from initiatives that do exist highlight the merits of beginning with a problem that will likely gain broad support and has a high likelihood of successful resolution. Crowdsourcing potential solutions to regulatory problems, paired with strong executive sponsorship, has also proven rewarding. Finally, multi-disciplinary teams with complementary skill sets can help foster long-term regulatory transformation.

IMPLEMENTATION CONSIDERATIONS

Many of the innovative regulatory initiatives described above are in the early stages of implementation. Consequently, empirical data are limited, including on their impact on financial inclusion. However, it is clear that no single initiative is a "silver bullet" for effective regulation. Many are resource intensive and require careful cost-benefit analysis.

Regulators in emerging and developing economies need to remain agile and open as they innovate and create regulatory initiatives. Once a feasibility assessment has been conducted, it is good practice to engage with a broad range of stakeholders to identify issues and brainstorm solutions. Small experiments and quick wins increase momentum, promoting buy-in among executives and the wider institution. Proportionality is an important consideration in any initiative, as is combining and carefully sequencing initiatives for maximum impact. Throughout the process, regulators may benefit from inter-agency collaboration and opportunities for mutual learning. Ultimately, success is measured through the theory of impact and metrics that had been developed prior to implementation. When effectively carried out, innovative regulatory initiatives enable inclusive FinTech and support regulators in long-term capacity-building.

Introduction

A priority of the UNSGSA's advocacy on technology-enabled innovation in financial services is to encourage good regulatory practices for FinTech.[2] To ensure that FinTech is inclusive, safe, and responsible, it is vital that regulators[3] have access to reputable advice when assessing, selecting, and implementing regulatory options.

Over the past three years, regulators in advanced, emerging, and developing economies have developed a number of promising initiatives to regulate and adapt regulatory frameworks for FinTech. These include innovation offices, regulatory sandboxes, and RegTech for regulators. Sharing their different national experiences is central to accelerating empirical evidence and creating good practices.

This report examines the potential impact of regulatory innovation on inclusive FinTech and distils early lessons learned. It also proposes Implementation Considerations for authorities seeking to enable inclusive FinTech through innovative regulatory initiatives of their own. The report builds on previous work in the field, including the G20 High-Level Principles (G20 HLP) for Digital Financial Inclusion (G20, 2016).

Semi-structured interviews with over 40 regulatory authorities and other subject matter experts in more than 20 advanced, emerging, and developing economies form the basis of this report. The methodology and a list of interviewees are set out in Annex 1.

Chapter 1 describes the relationships between financial innovation and financial inclusion. It discusses the dynamics of regulating FinTech and balancing regulatory objectives—from financial inclusion and consumer protection to financial stability and integrity.

Chapter 2 examines the three major innovative regulatory initiatives: innovation offices, regulatory sandboxes, and RegTech for regulators. It explains how each works in practice, its impact on financial inclusion, and key lessons learned. Case studies and examples illustrate insights and provide empirical evidence.

Chapter 3 presents practical, evidence-based Implementation Considerations to assist regulators in emerging and developing economies with their own regulatory initiatives.

2 For the purposes of this report, "FinTech" is defined as technology-enabled innovation in financial services. This is in accordance with the definition used by the UNSGSA FinTech Working Group and by the Financial Stability Board's FinTech Issues Group (FSB, 2017). The terms "FinTech," "technology-enabled financial innovation," and "financial innovation" are used interchangeably throughout. Similarly, the terms "inclusive FinTech," "inclusive innovation," and "inclusive financial innovation" are used interchangeably.

3 The term "financial regulators" is used throughout this report to encompass any and all authorities with jurisdiction over any area of financial services. This includes central banks, securities regulators, and other agencies with financial supervisory responsibility.

Chapter 1: Financial Innovation, Financial Inclusion, and Regulatory Innovation

1.1 TECHNOLOGY-ENABLED FINANCIAL INNOVATION AND ITS IMPACT ON FINANCIAL INCLUSION

By providing access to and enabling active use of affordable financial services, financial inclusion can generate significant benefits for the unbanked and underbanked. It may also become an engine for economic growth. Mobile phones and advancements in cloud computing, artificial intelligence (AI), machine learning (ML), big data analytics, and blockchain enable the creation of innovative business models, products, and services that support financial inclusion. These innovations can increase access, lower operating costs, and improve efficiency and customer experience. However, they may also adversely affect financial inclusion and in some cases lead to financial exclusion. This section reviews some of these new business models and products through the lens of four main financial areas: (1) payments, (2) lending, (3) savings, and (4) insurance. Figure 1 below provides a summary of these models, the technology involved, potential benefits for financial inclusion, and associated challenges and risks.

Figure.1: How technology drives innovation for financial inclusion

LEGEND
- Mobile / Internet
- Cloud Computing
- AI, ML, Big Data
- Blockchain
- Internet of Things (IoT)

	New Business Models / Financial Products	Technology / Products	Examples of Key Benefits	Examples of Key Challenges/ Risks
Payments	1 Mobile Money - P2P Transfers	Mobile / Internet, Cloud Computing, Blockchain	• Simple, more reliable, cost effective, and faster than other methods • Can help lift people out of poverty	• Fraud risk from agents • Lack of interoperability • Relatively low active usage rates
Payments	2 Digital Payments & Remittances	Mobile / Internet, Cloud Computing, Blockchain	• Lower costs, higher transparency, and higher privacy • Significant savings in time and travel costs	• Data security risks • Providing personal information which can be lost or stolen
Lending	3 Credit Risk Assessment	Mobile / Internet, Cloud Computing, AI, ML, Big Data	• Access to loans, which was not possible with traditional credit risk assessment models	• May create gender bias and/or income inequality • Spurious correlations from the data
Lending	4 Alternative Lending / P2P Lending	Mobile / Internet, Cloud Computing, AI, ML, Big Data +2 +3	• Access to loans to unbanked and underbanked • Faster and more efficient	• Higher borrowing costs when compared to bank loans • Risk of over-indebtedness
Savings & Insurance	5 Digital Savings	Mobile / Internet, Cloud Computing, AI, ML, Big Data	• Lower costs, increased liquidity, and higher transparency • Lower risk of theft	• Significant customer financial capability required • Regulation / protection of the float
Savings & Insurance	6 Digital Insurance	Mobile / Internet, Cloud Computing, AI, ML, Big Data, Internet of Things (IoT) +2	• Lower costs, increased liquidity, and higher transparency • Faster and more efficient	• Significant customer financial capability required

Source: UNSGSA FinTech Working Group and CCAF (2019)

DIGITAL PAYMENTS AND MOBILE MONEY

Digital financial services through mobile phone technology has become one of the primary ways to accelerate financial inclusion in emerging and developing economies. The number of people connected to mobile phones surpassed 5 billion globally in 2017, with 3.7 billion in developing economies (GSMA, 2018a). Mobile money (providing financial services through a mobile device) has demonstrated significant growth and adoption over the last 10 years. At the end of 2017 there were more than 276 mobile money deployments in 90 countries (47 of which had over 1 million active accounts) serving 191 million active users and processing an average of $1 billion per day (GSMA, 2018b). The scale of mobile money in emerging and developing economies is impressive: More than two thirds of the combined adult population of Kenya, Rwanda, Tanzania, and Uganda actively use mobile money[4] (GSMA, 2018b). The most successful example is M-Pesa in Kenya, which is part of the mobile network operator (MNO) Safaricom. Founded in 2006, M-Pesa currently reaches at least 84 percent of the Kenyan adults living on less than $2 per day—more than 21 million active users (Safaricom, 2018). Mobile money provides significant benefits for the unbanked and underbanked through lower fees, time savings, and reductions in travel costs. A study in Kenya showed that P2P transfers through M-Pesa cost users less than traditional methods[5] while the cost savings allowed them to send more money (Morawczynski, 2009). Mobile money has also demonstrated that it can help lift people out of poverty: In Kenya, M-Pesa increased per capita consumption levels and lifted 194,000 households, or 2 percent of Kenyan households, out of poverty (Suri and Jack, 2016).

Other forms of mobile digital payments such as bill payments, merchant payments, international remittances, and government disbursements have also demonstrated strong growth over the past few years. In 2011, these transactions accounted for 7.8 percent of total mobile money transactions; by 2016, this share had more than doubled to 18.8 percent (GSMA, 2016a). China is the largest mobile payments market in the world—in 2016, mobile payments hit $5.5 trillion, roughly 50 times the size of the $112 billion U.S. market (Seeking Alpha, 2018). Alipay provides a good example of the success of digital payments in China. A division of Ant Financial, Alipay uses quick response (QR) codes for P2P money transfers, bill payments, mobile top-ups, ride hailing, insurance, and many other types of payments. In the last quarter of 2016, Alipay had a 54 percent share of China's mobile payment market (Financial Times, 2017).

International remittances represent another important form of digital payments. As one of the largest sources of external financing in emerging and developing economies, they often serve as a lifeline to the poor (Donovan, 2012). Digital channels and instruments for remittances can significantly lower transaction costs, are more secure and transparent, offer more consumer choice, and increase the recipient's household income (due to lower fees). In Africa, mobile technology has cut remittance costs by half (GSMA, 2016b).

Conditional government cash transfers through digital payments in the form of debit cards have also contributed to higher financial inclusion in emerging economies. A leading example is Brazil's Bolsa Família program, which has been credited with helping to significantly reduce levels of absolute poverty and inequality in the country. Started in 2003 and funded by less than 0.5 percent of the country's GDP, it now facilitates small cash transfers to 46 million Brazilians whose current income places them below the poverty line (Barrientos et al., 2014). By providing transfers through debit cards that allow money to be withdrawn at over 14,000

4 A mobile money account is typically counted as active if it is used to perform at least one P2P payment, bill payment, bulk payment, cash-in to account, or cash-out from account within 90 days (GSMA, 2018b).

5 Traditional methods include giving money to friends and family traveling back to the rural area, and though bus and matatu (shared taxi) companies.

locations, Bolsa Família helps support families in times of hardship and unexpected economic shock. Another example is India's Jan Dhan Yojana scheme, (PMJDY) launched by Prime Minister Modi in 2014, which has opened more than 300 million bank accounts for the country's unbanked (Business Standard, 2018). These accounts can be used to digitally transfer government social benefits to the poor.

While digital payments provide significant benefits for the unbanked and underbanked, key risks and challenges need to be considered, such as potential fraud by mobile money agents due to the lack of knowledge and awareness of individuals using the products. Digital payments can also create data security risks, with customers providing personal information that may be lost or stolen. Another consequence of a lack of knowledge is the low active usage of digital payment products among the poor and those living in rural areas.

DIGITAL LENDING

Digital lending, or the ability to offer loans in an automated and almost instantaneous way through digital channels, is an important enabler of financial inclusion. A wide variety of business models have emerged in this area, including P2P lending platforms that connect borrowers and investors. Partnerships between mobile network operators (MNOs) and banks or other financial institutions have also emerged. Partnership models involving FinTech companies and lending platforms, including P2P, are developing as well. Other innovative business models have emerged, such as digital payment firms using customer data to extend loans (e.g., PayPal) and digital banks that have no physical presence but provide loans and other financial products through mobile phones and the internet (e.g., Ant Financial's MYbank). In general, digital lending products can be classified by the type of borrower targeted: (1) individual consumers and (2) micro, small, and medium enterprises (MSMEs).

In emerging and developing economies, digital lending for individuals has been enabled by the large number of mobile money services such as M-Pesa, which mainly targets existing MNO customers. In Tanzania, for instance, Timiza and M-Pawa are digital lending products offered by the MNOs Airtel and Vodacom, respectively. They require borrowers to be registered with the MNO. Eligibility is tied to the borrower's previous subscription and use of voice and SMS services, digital payments and, if applicable, bank history. Loans tend to be short term and of low value, and leverage non-traditional data (mobile airtime, data top-ups, mobile money transactions, age of applicant, prior loan status, etc.) to assess the borrower's credit risk.

Digital lending deployments for MSMEs follow similar business models as digital lending for consumers in emerging and developing economies. These platforms supplement traditional financial data with alternative data sources[6] to evaluate credit risk. They then provide loans through mobile phones and the internet to micro-entrepreneurs and small businesses that may not have been able to access credit from traditional sources. These loans are mostly used to finance working capital and, less frequently, to expand businesses. Digital lending for MSMEs in emerging and developing economies is an essential way to close the large financing gap for these firms. In fact, 65 million enterprises, or 40 percent of formal MSMEs in emerging and developing economies, lack access to credit. This represents an unmet financing need of $5.2 trillion (SME Finance Forum, 2017). In China, Ant Financial's MYbank has used digital payment transaction data to underwrite more than $70 billion in cumulative loans to 5 million small businesses, microenterprises, and entrepreneurs since 2015 (Office of the UNSGSA et al., 2018).

Digital lending can provide significant benefits to unbanked and underbanked customers and MSMEs in emerging and developing

6 Alternative data sources might include location data, mobile money and mobile telephony usage history, and/or social media profiles (Chen and Faz, 2015).

economies. The most immediate benefit is improved access to loans that were previously not available or were too expensive. By accessing loans through digital lending companies, the poor, marginalized, and MSMEs can effectively build a credit history, which may enable them to get loan offers from traditional banks in the future.

However, risks with digital lending can negatively impact consumers and MSMEs, and, in some cases, lead to financial exclusion. This particularly seems to be the case in small digital consumer credit. In Kenya and Tanzania, the spread of digital credit has raised concerns about the risk of excessive borrowing and over-indebtedness, with high delinquency and default rates among the poor (Izaguirre et al., 2018). In Kenya, some new digital credit products have led to financial exclusion, with borrowers becoming blacklisted by credit bureaus (Wright, 2017). In China, lack of regulation led to significant domestic growth in P2P lending. However, the tremendous growth created fraudulent activities and some sources estimate that two thirds of all P2P lenders in China have already failed. In August 2016 the country's banking regulator issued a set of more restrictive rules and began working to remove bad actors from the sector (Martin, 2018). These factors have since led to slower growth rates in digital lending in China.

DIGITAL SAVINGS

Mobile phones offer the poor unprecedented access to savings, whether through storing cash via a mobile money account or opening a dedicated savings account linked to mobile money. The main benefits of digital tools over traditional and informal saving methods[7] are higher transparency, lower costs, and increased liquidity. Digital tools can help customers develop savings targets and allow them to receive "nudges" that encourage saving on a regular basis. Juntos, a FinTech platform based in San Francisco, for instance, sends periodic SMS messages reminding customers to save. Several studies have shown that use of digital savings accounts can lead to higher savings overall. One field experiment in Afghanistan set up a mobile savings payroll deduction system for 967 employees at a firm. Employees assigned a default contribution rate of 5 percent were 40 percent more likely to contribute to the account six months later than those who had no default contribution (Blumenstock et al., 2016).

One key constraint on digital savings is a lack of financial literacy among the poor in emerging and developing economies. A study in Tanzania identified consumers' lack of understanding of products and services as a key barrier to uptake. Simply offering information about products and services drove an increase in uptake (Busara Center for Behavioural Economics, 2017). Potential risks are also present on the provider side, particularly with respect to protection of customers' digital savings. Many digital savings providers in emerging and developing economies are not covered by deposit insurance, and risks may be exacerbated in countries with weak banking sectors. Regulators, therefore, face the challenge of mitigating the risks to customer funds without stifling the benefits of digital savings.

DIGITAL INSURANCE

Microinsurance, which refers to small amounts of insurance coverage through very small premiums, provides an opportunity for the poor and marginalized to access affordable insurance against unexpected emergencies and shocks. Mobile phones and mobile payments are essential to the growth of microinsurance in emerging and developing economies. Mobile phones are an important distribution channel and deliver significant benefits over traditional insurance products, such as lower costs and ease of use and access. By the end of 2015, 120 mobile

7 Traditional methods refer mainly to savings accounts at banks and other financial institutions. Informal methods may include rotating savings and credit associations (ROSCAs), savings clubs, and stashing away small amounts of money or other resources.

insurance services existed in 33 emerging and developing economies for a total of over 30 million policies (GSMA, 2016). By 2017, at least 61 million policies had been issued—a significant amount that had more than doubled in two years (GSMA, 2018c). There was also a shift towards a more diverse range of products over this period. Life insurance and health/hospital insurance, the top two products offered, represent 65 percent of total products. Others include a combination of life, health, and accident insurance (18 percent of the total), and accident/disability insurance (11 percent of the of total) (GSMA, 2018c).

FinTech firms often partner with insurance providers and MNOs to offer customized microinsurance products. The FinTech firm onboards clients, collects premiums, communicates with clients and insurance staff, and captures client data. By using mobile phone infrastructure the process becomes more efficient, thereby lowering costs and reducing turnaround times for enrollment, claims processing, and premiums collection. With more than 40 million registered users in 20 emerging and developing economies (MicroEnsure, 2018), MicroEnsure is a prime example of a FinTech that provides microinsurance products. Through partnerships with MNOs, the company can offer customers free basic life, accident, and hospital insurance via mobile phone. Microinsurance providers can also offer crop insurance with the help of AI, ML, and big data,[8] coupled with satellite imagery and sensors that measure crop yield. This information can ultimately enable more stable income streams that can improve economic livelihoods for farmers.

AI, ML, and big data can also enable the adoption of digital insurance products that may bring significant benefits to the unbanked and underbanked. However, there are increased risks related to flaws in the functioning of big data tools. Consumers may have limited ability to correct information errors, challenge the use of data/decision-making processes, or seek clarifications. There are also other broad ethical considerations linked to the use of big data, including the risk of penalizing deviations from expected norms. This could push individuals to avoid certain behaviors or contact with certain people or companies, and avoid visiting certain areas (IAIS, 2017). There is also a risk that more granular segmentation of insurance pools could lead to the financial exclusion of certain individuals (The Economist, 2017).

1.2 FINANCIAL INNOVATION, FINANCIAL INCLUSION, AND REGULATORY OBJECTIVES

Financial regulators also need to consider how financial innovation[9] interacts with regulatory objectives such as financial inclusion (I), financial stability (S), financial integrity (I), and consumer protection (P)—as depicted by the Consultative Group to Assist the Poor's (CGAP) I-SIP framework (CGAP, 2012).

8 AI, ML, and big data analytics have not yet been applied at scale to micro and digital insurance.
9 Financial innovation has been adopted by some regulatory authorities as a mandate, but so far has been limited to very few regulators.

Figure 2 below summarizes the potential positive and negative impacts that technology-enabled financial innovations may have on the four I-SIP regulatory objectives.

Figure.2: The potential impact of financial innovation on regulatory objectives

Regulatory Objectives (I-SIP Framework)	Positive Impact	Negative Impact
Financial Inclusion	• **Lower costs and more efficient** than traditional and/or informal systems • **Access to credit via alternative data sources** for unbanked and underbanked • **Simple, more reliable, and significantly faster** than informal methods	• **Micro-segmentation of risk** through use of Big Data analytics may lead to financial exclusion • **High borrowing rates on digital loans**, which make it difficult to fully repay • **Gender bias and/or income inequality** from the use of AI, ML and Big Data analytics
Financial Stability	• **Increased diversification of deposit base and loan portfolios** can reduce concentration among systemic financial institutions • **Improved data quality and risk data aggregation** can increase systemic resilience	• **Increased financial interconnectedness** may result in expedited adverse financial shocks • **Increased operational risks**, such as cyber risks, may increase systemic risk
Financial Integrity	• **Promote traceability of transactions**, supporting CFT • **Facilitate easier verification for KYC process**, thereby reducing compliance costs • **Regulators' use of technology** to support financial integrity	• **Virtual currencies may facilitate anonymous funding sources or payments** rendering AML/CFT checks to be difficult • **Decentralized nature of blockchain/ DLT may render AML/CFT enforcement unclear** if operating outside of country
Consumer Protection	• **Increased transparency, more and better information** to consumers, reducing information asymmetries • **Comparison of financial products and services** more quickly and easily	• **Limited transparency of fees and charges**, which can mislead consumers • **Over-indebtedness** due to lack of visibility of multiple digital loans of each borrower, push loan tactics • **Lack of data protection**, leading to misuse of customer data

Sources: BCBS (2018), CGAP (2012), Plaitakis and di Castri (2018), and UNSGSA FinTech Working Group and CCAF (2019)

Adding to the challenge, regulators face five main difficulties in regulating technology-enabled financial innovation:

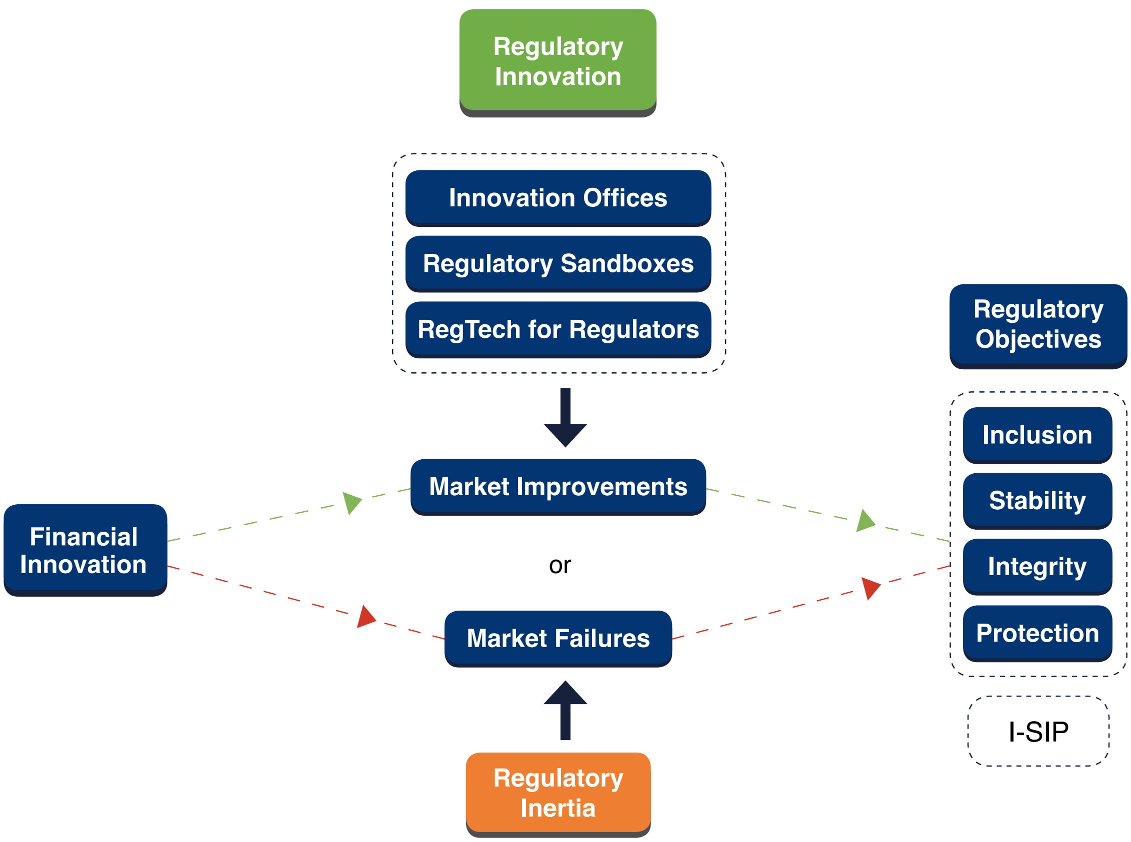
1. They are not usually technology experts, which may make it difficult to understand and assess innovative business models and practices.
2. Many new innovators are not financial services providers as traditionally defined and may not definitively fall under regulatory oversight.
3. Central banks and regulators are traditionally risk-averse, often valuing stability over innovation. However, innovation can create opportunities to simultaneously enhance stability and inclusion.
4. Regulators are typically resource-constrained, with technology-led innovation presenting additional challenges.
5. Pressure from incumbent financial services providers to maintain the status quo may also exist.

Faced with these challenges, regulators in advanced, emerging, and developing economies have responded by innovating on their own.[10] The innovative regulatory initiatives they have created seek to ensure that financial innovation strengthens their regulatory policy objectives, including financial inclusion, and mitigates potential negative impacts. Figure 3 captures these dynamics in an analytic framework.[11]

This report describes the lessons learned from the early implementation of innovation offices, regulatory sandboxes, and RegTech for regulators. These lessons are especially relevant for regulators in emerging and developing economies that seek to promote inclusive financial innovation. If financial innovation can enable "digital leapfrogging," then regulatory innovations can support "regulatory leapfrogging" as a regulatory response.

Key prerequisites should be carefully considered while developing or implementing innovative regulatory initiatives. To that end, the UNSGSA's FinTech Working Group has identified a number of key prerequisites that enable FinTech to be inclusive and thrive (UNSGSA, 2017): data privacy, cybersecurity, digital identification, physical infrastructure such as agent networks, connectivity, interoperability, financial and digital literacy, and fair competition.[12] These key prerequisites are highlighted further throughout this report.

Figure.3: A Framework for Financial Innovation, Regulatory Innovation, and Regulatory Objectives



Source: UNSGSA FinTech Working Group and CCAF (2019)

10 Examples of economies engaging in innovative regulatory innovation are set out in Figure 4, with a full list in Annex 2.
11 The I-SIP framework is set out in CGAP (2012).
12 The IMF and the World Bank have also developed the Bali FinTech Agenda, which is a useful reference in this context (IMF, 2018). The Agenda brings together and advances key issues for policymakers and the international community to consider as individual countries formulate their policy approaches. The Alliance for Financial Inclusion's Sochi Accord also sets out a number of calls to action on FinTech for financial inclusion (AFI, 2018).

Chapter 2: Innovative Regulatory Initiatives Around the World

Innovative regulatory initiatives have become increasingly common around the world over the last five years. Figure 4 below illustrates countries that have developed such initiatives. Annex 2 provides the name of each initiative, its host operator, and other details.

Globally, regulators face the challenge of rapidly changing financial services markets. New FinTech business models, products, and services raise questions on whether, and how, they should be regulated. These issues are particularly acute in emerging and developing economies where regulators often have limited capacity and resources. Authorities need to carefully balance the opportunities and risks that financial innovation presents for financial inclusion and other regulatory objectives (CGAP, 2012 and Plaitakis and di Castri, 2018).

This chapter outlines common initiatives undertaken by regulators looking to promote inclusive financial innovation in advanced, emerging, and developing economies. It describes the initiatives in detail, discusses their empirical/potential impact on financial inclusion, and distils lessons learned from implementation. These learnings are important for cross-regional knowledge and policy sharing, and especially valuable for regulators with limited resources. When possible, empirical study can broaden awareness of regulatory innovation options and cost-benefit considerations.

Figure.4: Examples of Innovative Regulatory Initiatives Around the World

Source: UNSGSA FinTech Working Group and CCAF (2019)

2.1 INNOVATION OFFICES

Some jurisdictions have established innovation offices as a first step in the regulatory innovation journey. Innovation offices may have different names, forms, and functions, but all engage with, and provide regulatory clarification to, financial services providers that seek to offer innovative products and services.

Although this report refers to such functional units as innovation offices, there are many similar initiatives whose sole function is to promote and facilitate FinTech. One example is the Estonian Financial Supervision Authority (EFSA), which directly connects innovators with specialists that offer guidance on relevant legal frameworks and a connection to licensing functions (EFSA, 2018).

A number of regulators have also launched FinTech accelerators. Accelerators typically provide or facilitate mentoring, work spaces, consultations with industry experts (including on regulation), networking opportunities, and access to funding. Some, such as the Global FinTech Hackcelerator organized by MAS, allow regulators to work with firms to solve industry problem statements (MAS, 2018). Others, such as the Dubai International Financial Centre's FinTech Hive,[13] provide inside knowledge and direct feedback from target user groups.

Figure 5 below highlights the global distribution of existing or informal innovation offices and FinTech accelerators. Annex 3 provides further details, including the names of each initiative and its host operator.

Figure.5: Examples of Global Innovation Office Initiatives by Jurisdiction

Sources: UNSGSA FinTech Working Group and CCAF (2019), and European Supervisory Authorities (2019)

13 DIFC (2018). FinTech Hive at DIFC. https://FinTechhive.difc.ae/

The key objective of innovation offices is to facilitate regulator–innovator engagement and mutual learning in a pro-innovation setting. This interaction helps regulators identify emerging issues and may inform policy development. It is also essential for innovators as it helps them understand the current regulatory landscape in a local context and where FinTech-related regulations may be heading.

2.1.1 INNOVATION OFFICES IN PRACTICE

Innovation offices are a compelling option for capacity-constrained regulators in emerging and developing economies. They are often easier to establish than other regulatory initiatives since they require no protracted legislative or regulatory change. Regulators can start small and simply educate innovators on the regulatory environment in which they operate—for example, by explaining relevant regulations for a planned new service or providing licensing guidance. An innovation office can then iteratively expand based on demand. Bank Negara Malaysia's (BNM) Financial Technology Enabler Group (FTEG) is a prominent example of this.

Innovation offices work in many ways. A regulator may hold office hours; offer a dedicated telephone number; provide an email address; maintain a website; or link innovators with a dedicated case officer. Offering office hours is typically the least resource-intensive approach while providing case officers can be more resource and cost intensive (with larger benefits, however).

The innovation office within the Commodity Futures Trading Commission (CFTC), the LabCFTC, holds office hours where entrepreneurs and innovators discuss questions and concerns and may offer presentations.[14] The recently launched OJK (Otoritas Jasa Keuangan) Innovation Centre for Digital Financial Technology is a more cost-intensive networking space where innovators and regulators meet to collaborate and share ideas.[15]

Regulators can use innovation offices as an evidence base for broader regulatory reform. A good example is the Netherlands Authority for the Financial Markets (AFM) which amended its interpretation of some rules and provided clearer guidance on others based on interactions with its Innovation Hub.[16] Another example is the United Kingdom (UK) Financial Conduct Authority's (FCA) Innovation Hub, which consults on regulatory barriers to innovation (FCA, 2014a).

Innovation offices can provide insights on whether further innovative regulatory initiatives are necessary or appropriate. For instance, they may provide input on the pros and cons of introducing a regulatory sandbox to facilitate product or policy testing. One of the earliest regulatory sandboxes, developed by the FCA, grew out of evidence of demand for the services of an existing innovation office. Through RegTech solutions, innovation offices may also increase awareness of the potential of technology for regulators themselves.

Regulatory objectives and eligibility criteria

A number of innovation offices use eligibility criteria to determine which providers they engage with on specific regulatory objectives. For those with a financial inclusion remit, this type of alignment can be a powerful promotion and support mechanism for inclusive financial innovation. Section 2.1.2 below discusses the topic further.

Eligibility criteria also help regulators prioritize engagement with providers deemed most critical to achieving the innovation office's established objectives. This is an important design feature for regulators in emerging and developing economies, where resources are often scarce and capacity is an important consideration. While not all regulators publish their eligibility criteria, Figure 6 below describes those that are common.

14 LabCFTC (2018). "Announcing LabCFTC Office Hours." https://www.cftc.gov/sites/default/files/2018-09/labcftc_officehours102318.pdf

15 Indonesia Investments (2018). "Rapid Development of FinTech Industry in Indonesia." https://www.indonesia-investments.com/finance/financial-columns/rapid-development-of-FinTech-industry-in-indonesia/item8949

16 Source: Interview with Netherlands AFM (August 2018).

Figure.6: Common Eligibility Criteria of Innovation Offices

Name of criteria	Description	Countries who use this
Genuine innovation	The FinTech product or service is truly innovative and/or groundbreaking. In other words, it is significantly different from those currently available.	Australia (ASIC), Bahrain (CBB), Canada (OSC), Cyprus (CySEC), Estonia (EFSA), Hong Kong (SFC), Netherlands (AMF & DNB), Singapore (MAS), UK (FCA), US (CFTC)
Consumer benefit	The FinTech product or service has the potential to provide a better outcome for investors and consumers. Note that this may implicitly include financial inclusion benefits.	Australia (ASIC), Bahrain (CBB), Canada (OSC), Estonia (EFSA), Hong Kong (SFC), Netherlands (AMF & DNB) Singapore (MAS), UK (FCA), US (CFPB), US (OCC)
Financial inclusion	The FinTech product or service has the potential to promote financial inclusion.	Bahrain (CBB), Indonesia (OJK), Malaysia (BNM)
Need for support	The FinTech product or service should have a genuine need for support—if the request is not eligible then it will be directed elsewhere.	Malaysia (BNM), Singapore (MAS), UK (FCA)
Background research	The provider has sought to understand the regulatory framework before approaching the innovation office.	Canada (OSC), Netherlands (AMF & DNB), Singapore (MAS), UK (FCA)
Serve domestic market	The provider intends to offer the proposed product or service to the domestic market	Bahrain (CBB), Malaysia (BNM)
Risk mitigation	The provider has ensured that potential risks arising from the proposed product or service are assessed and mitigated, including to consumers and the market.	Bahrain (CBB), Cyprus (CySEC), Estonia (EFSA), Hong Kong (HKMA), Malaysia (BNM), Singapore (MAS), US (CFPB)

Source: UNSGSA FinTech Working Group and CCAF (2019)

2.1.2 INNOVATION OFFICES AND FINANCIAL INCLUSION

While the number of innovation offices continues to grow, there is still limited evidence of their impact on financial inclusion due to the limited experiences in advanced, emerging, and developing economies. Despite this fact, there are a number of channels through which innovation offices may promote financial inclusion.

2.1.2.1 Directly promoting financial inclusion

Three of the approximately 33 innovation offices currently in existence explicitly promote financial inclusion.[17] BNM's FTEG supports innovation that improves financial inclusion in the country.[18] OJK Infinity in Indonesia domestically promotes engagement between the FinTech industry, regulators, and the government toward the goal of financial inclusion. This includes through acting as a forum for discussion and collaboration, and a center of education (Silaen, 2018). Finally, the Central Bank of Bahrain encourages financial inclusion through its FinTech Unit.[19]

Innovation offices can support inclusive financial innovations coming to market by explicitly targeting providers whose offerings promote financial inclusion. A prominent

17 Annex 3 sets out innovation offices around the world.
18 https://www.myfteg.com
19 This includes through leading the development of a regulatory sandbox which has the explicit objective of a regulatory sandbox focused on encouraging financial inclusion (see Section 2.2).

example comes from the UK, where the FCA's innovation office helps financial inclusion-focused providers, and others, understand the regulatory framework as it applies to them (Woolard, 2015). The FCA helped a firm that employed alternative credit scoring methods to quickly determine whether their service was a regulated activity. Annex 6 contains an in-depth case study of the FCA's innovation office.

Innovation offices that do not carry a financial inclusion mandate can still facilitate inclusion-oriented innovations through a number of channels, as outlined below.

2.1.2.2 Supporting the development of regulatory enablers of financial inclusion

Reduced costs for innovators and consumers

Innovation offices are a key point of contact between innovators and regulators. Engagement helps innovators quickly and easily understand regulatory frameworks, thereby reducing barriers to entry and innovation and reducing regulatory uncertainty. Mitigating an otherwise costly and time-consuming process carries other significant positive outcomes. Lower costs mean lower prices for end consumers—and better access to financial services at the base of the pyramid.

By way of example, the MAS notes that the questions it receives in its innovation office are wide-ranging, from how to set up a business in Singapore to understanding what support the MAS provides. Questions on the licensing process are also common, with innovators seeking clarification on MAS regulations and technology risk management guidelines. A recent FinTech market landscaping by the Kenya Capital Markets Authority also revealed that an innovation office or "hotline" would go a long way in resolving regulatory questions faced by start-up entrepreneurs (FSD Kenya, 2018).

The high cost of regulatory uncertainty is highlighted in the U.S. where "…the cost of researching applicable laws and regulations can be particularly significant for FinTech firms that begin as technology start-ups with small staffs and limited venture capital funding. FinTech start-up businesses told us that navigating this regulatory complexity can result in some firms delaying the launch of innovative products and services—or not launching them in the United States—because the FinTech firms are worried about regulatory interpretation" (GAO, 2018).

Improved consumer protection

Consumer protection is an integral part of financial inclusion (Mazer and McKee, 2017). As highlighted in Chapter 1, financial innovation may prompt both opportunities and risks for consumer protection. Innovation offices are a way for regulators to support inclusive financial innovation by ensuring adequate consumer protection. Early engagement on new products, services, and business models allows them to advise innovators about consumer protection requirements, which promotes compliant innovation. In Hong Kong, the Securities and Futures Commission's FinTech Office has helped innovators more efficiently develop compliant products by clarifying appropriate regulations (GAO, 2018).

Engaging with the industry on FinTech helps regulators understand key trends and potential issues and risks. Over half of the regulators interviewed shared that prior to the establishment of an innovation office, they had little knowledge of or data on the number of FinTech start-ups operating in their country, which sectors they operated in, their business models, or their product offerings. Consequently, there had been little assessment of the opportunities and risks that could arise.

Better informed policymaking

Innovation offices often help identify the risks of innovative new financial services and their implications for regulatory policy. Risks may include gaps in regulatory parameters, regulatory arbitrage, and unclear regulations. In this way, innovation offices facilitate an improved policy environment that significantly benefits financial inclusion. By way of example, BNM's FTEG led a nationwide campaign that invited the public to provide input on pain points and areas for improvement in the delivery and consumption of financial services (BNM, 2017a).

Increased competition

Innovation offices decrease barriers to entry by reducing regulatory uncertainty, which promotes the entry, capitalization, and growth of new firms in financial services markets. New entrants, in turn, promote innovation and competition. Increased competition can result in lower prices for consumers, a greater range of products, and better services, all of which promote financial inclusion (Mazer and Rowan, 2016).

A prominent example of a regulator using an innovation office to promote competition is the UK FCA. The FCA has worked with over 600 innovative companies through its innovation office, with many going on to become licensed firms (Woolard, 2018b). While the number of firms that engage with innovation offices and the subset of those that go on to become regulated may be a crude measure of success, it gives an approximation of the benefits of increased competition.

The volume of firms supported through innovation offices also compares favorably with the much smaller number of firms supported through regulatory sandboxes.[20] To date, regulatory sandboxes around the world have supported around 100 firms (UNSGSA FinTech Working Group and CCAF, 2019). In contrast, the joint AFM/DNB Innovation Hub in the Netherlands has provided regulatory clarification to around 600 firms (DNB, 2016), while the MAS Financial Technology and Innovation Group (FTIG) has engaged with more than 500 companies from Singapore and overseas. In the U.S., the Bureau of Consumer Financial Protection (BCFP) estimates that it engages with over 100 innovative firms per month through a combination of office hours and other engagements. Another regulator, the Commodity Futures Trading Commission (CFTC), met with more than 200 innovative firms during the first year its innovation office was in existence (Forbes, 2018).

2.1.3 INNOVATION OFFICES – LESSONS LEARNED

While innovation offices exist in numerous global jurisdictions, the majority can be found in advanced economies or emerging economies nearing advanced economy status. Lessons learned are likely to be of particular interest to regulators in emerging and developing economies, given their capacity constraints and the relatively low costs associated with operationalizing an innovation office compared to a regulatory sandbox. Annex 6 contains an in-depth case study of the UK's FCA innovation office.

Innovation offices facilitate mutually beneficial dialogue

Both regulators and industry are clear on the mutual benefits of regulators engaging with innovation in financial services. Through direct engagement with regulators, innovators can gain an increased understanding of how the regulatory framework applies to their business. Interviews with entrepreneurs in Singapore highlighted the value of in-person interaction. Similarly, the UK FCA observes that, "[The] transfer of ideas and innovation breaks down barriers to entry, giving firms more freedom and flexibility to innovate" (FCA, 2017b).

All of the 40 regulators interviewed for this report asserted the significant benefits of engagement with innovators, both in improving the market and mitigating risks to regulatory objectives. The Office of the Comptroller of the Currency (OCC) in the U.S. explains that, "Ongoing dialogue with all stakeholders… enables the OCC to stay abreast of current trends and developments, better understand the evolving needs of consumers… and solicit stakeholder feedback. Outreach also enables the agency to serve as a more effective resource and promote

20 While important, the number of firms supported is only one measure of success. Other metrics might include the number, and quality, of financial products available, and consumers' increased access to these.

awareness and understanding of OCC expectations" (OCC, 2016).

Other regulators highlighted the role that industry associations play as key stakeholders for innovation offices, advising members and raising concerns of inappropriate provider behaviors. MAS is an example of a regulator that has funded associations to undertake this type of role.

Innovation offices facilitate international regulatory knowledge exchange on financial innovation

Given the borderless nature of technology-enabled financial services, innovation offices benefit from coordinating with one another. Doing so facilitates peer learning, particularly on emerging regulatory initiatives for inclusive financial innovation. Numerous regulators underlined the inspiration and lessons taken from regulators who had launched innovative regulatory initiatives, including innovation offices. Authorities in Bahrain, for example, sought lessons learned by other jurisdictions at the outset of their initiatives, with a strong focus on regional and international collaboration.

Specific initiatives include bilateral cooperation agreements between innovation offices to facilitate information sharing and referral of innovators from one market to another.[21] These agreements may include a commitment to collaborate on joint projects, such as development of a regulatory framework on technology-led financial innovation. MAS and the Dubai FSA, for example, recently agreed to work on projects including digital and mobile payments, distributed ledger technology, big data, and application programming interfaces (APIs) (CrowdFund Insider, 2018).

Other platforms to facilitate peer learning and knowledge exchange include the Alliance for Financial Inclusion (AFI) and the Global Financial Innovation Network (GFIN). The GFIN envisages targeting multiple aspects of regulatory knowledge sharing on financial innovation while expanding on the common components of cooperation agreements, including establishing a network of regulators to promote information and knowledge sharing, and collaboration between regulators to undertake joint policy work. The third component, cross-border trials, is explained further in Section 2.2 on regulatory sandboxes (FCA, 2018c).

Innovation offices deliver the most impact when integrated within the regulatory ecosystem

Regulatory innovation is not the sole preserve of an innovation office, but innovation offices do carry the most impact when they are well integrated within a wider regulatory authority.

Internal engagement is a key enabler for innovation offices. Identifying regulatory barriers to innovation and strengthening the regulatory framework require close coordination with regulatory functions including supervisory, legal, and enforcement. LabCFTC in the U. S., for instance, has worked closely with its Office of General Counsel to understand parameters and limits (Forbes, 2018).

In recent years, a number of emerging and developing economies have launched National Financial Inclusion Strategies (NFIS) and established Financial Inclusion Units to coordinate them.[22] Integrating innovation office functions with these units may have the added advantage of aligning functions with NFIS objectives. Integration of financial inclusion remits within innovation offices have taken place in Bahrain, Indonesia, and Malaysia.

21 See Mueller et al. (2018) for examples and a comprehensive list of bilateral cooperation agreements signed by innovation offices.

22 For a list of countries that have developed an NFIS, see the World Bank's National Financial Inclusion Strategies Resource Center: http://www.worldbank.org/en/topic/financialinclusion/brief/financial-inclusion-strategies-resource-center

Innovation offices are only as good as their resources

An innovation office is only as useful as the quality of the regulatory resources behind it. Innovation offices are often able to start up quickly with a core staff of two or three, then expand based on need and demand. (By contrast, the design stage alone of a regulatory sandbox requires significantly more staff and even further resources in its implementation stage.) Innovation offices in both the UK and the U.S. have commenced with a lean approach and expanded as necessary.

Given that the main function of an innovation office is to clarify regulatory frameworks, quality of support is of primary importance. Staff must be well informed on the intersection of technology-led innovation and financial regulation. However, a number of innovators interviewed noted that the usefulness of an innovation office may be limited when there is a knowledge gap between regulators and innovators. Innovators in one jurisdiction, for example, observed that the regulator did not have a strong enough understanding of underlying technologies to provide useful advice and support.

A number of regulators also highlighted difficulties in attracting and retaining appropriate expertise for innovation offices given the niche skill set required: regulatory knowledge and an understanding of technological innovation in financial services.[23]

Innovation offices are a catalyst for a pro-innovation culture

Regulation is typically concerned with the prevention of harm—whether mitigating risks or protecting consumers or markets. On the other hand, supporting and promoting innovation, which is a prime activity of most innovation offices, may enable positive outcomes and prevent negative ones.

The importance of a strong internal mindset and culture that supports regulatory innovation was universally recognized by the 40 regulators interviewed for this report. A dedicated innovation office with knowledgeable staff and a strong will to push things through was identified as a key enabler of a pro-innovation culture.

Leadership and institutional engagement are critical enablers of innovation offices

Executive leadership and institutional support are important innovation office enablers. These enablers can support a pro-innovation culture, new skills and capabilities, and provision of sufficient resources. Senior leadership buy-in also encourages alignment among a regulator's internal stakeholders and functions. Accordingly, a number of authorities such as the Central Bank of Bahrain have given their innovation offices a direct reporting line to the governor or equivalent organization head.

Innovation offices function well in coordination with one another

In financial services regulation, multiple authorities often have jurisdiction over similar activities. This can lead to a complicated regulatory environment. The U.S. Government Accountability Office, for example, highlights the fact that "The complex U.S. financial regulatory structure can complicate FinTech firms' ability to identify the laws with which they must comply and clarify the regulatory status of their activities" (GAO, 2018).

Several jurisdictions have benefited from coordinating and integrating the activities of multiple regulators within a single innovation office. In the Netherlands, for example, the financial services regulator (AFM) and the central bank (DNB) have formed a joint Innovation Hub.[24] Innovative firms have a single point of contact for regulatory information and clarification.

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23 While resourcing levels will obviously vary considerably by jurisdiction, an innovation office will typically have at a bare minimum two working level staff dedicated to engaging in dialogue with relevant stakeholders, in particular innovators. This may be coupled with additional resources to advertise the services available through the innovation office, plus a general manager to oversee the team. Senior regulatory resource and oversight can also help to highlight internal and external credibility.

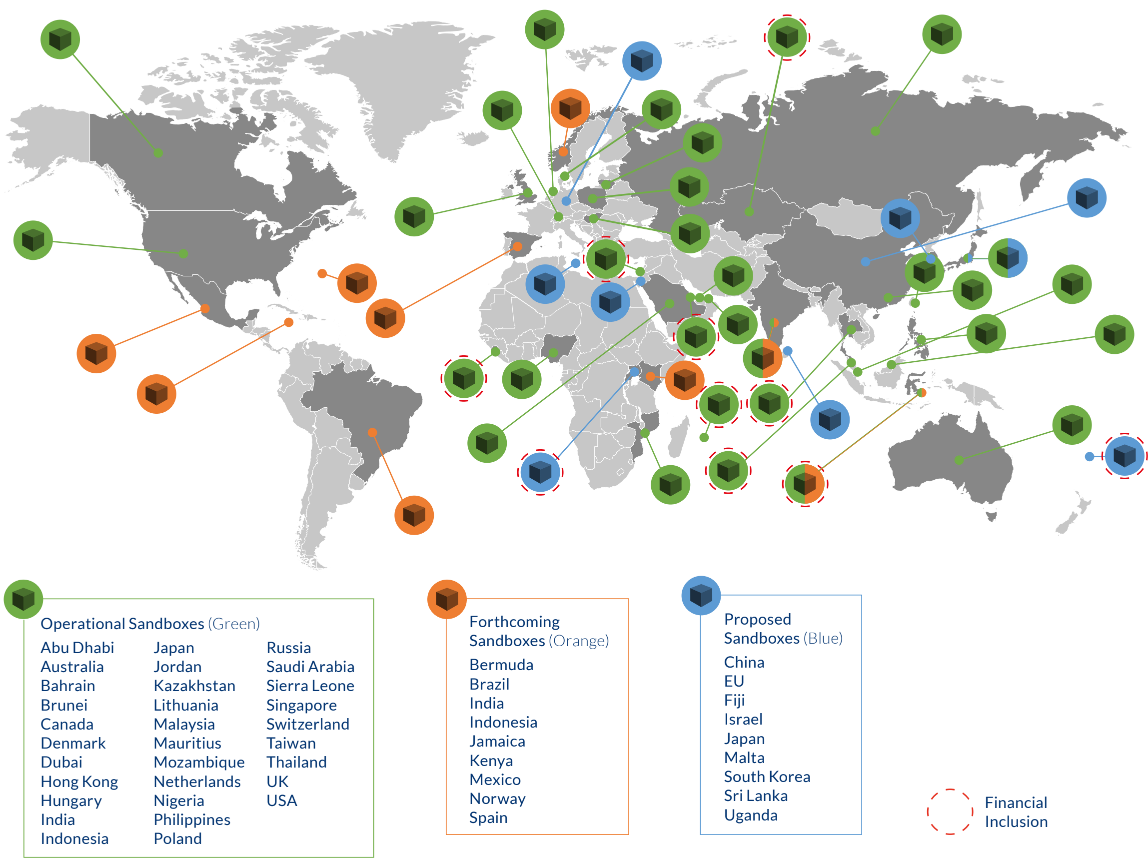
24 https://www.afm.nl/en/professionals/onderwerpen/innovation-hub

France's prudential regulator—the Autorité de Contrôle Prudentiel et de Résolution (ACPR)—and its securities regulator—the Autorité des Marchés Financiers (AMF)—also closely coordinate across innovation offices and initiatives.[25]

2.2 REGULATORY SANDBOXES

In recent years, regulatory sandboxes have become synonymous with regulatory innovation.[26] While terminology differs across jurisdictions,[27] sandboxes are, at their core, formal regulatory programs that allow market participants to test new financial services or business models with live customers, subject to certain safeguards and oversight. Global interest in sandboxes is strong, with regulatory sandboxes now live or planned in over 50 jurisdictions, as illustrated in Figure 7. Further details, including the name of each initiative, its host operator, and the country in which it operates can be found in Annex 4.

Figure.7: Examples of Global Regulatory Sandbox Initiatives by Jurisdiction



Sources: European Supervisory Authorities (2019), Jenik and Lauer (2017), Mueller et al. (2018), DFS Observatory (2018), and UNSGSA FinTech Working Group and CCAF (2019)

25 https://acpr.banque-france.fr/en/acpr/organisation/FinTech-innovation-unit
26 For detailed insights on regulatory sandboxes, see Duff (2017), Jenik and Lauer (2017), and Herrera and Vadillo (2018).
27 Some jurisdictions refer to these testing programs as "RegLabs" or "Innovation Labs." The terminology is important only to the extent that it distinguishes regulatory sandboxes from other innovative regulatory initiatives.

2.2.1 REGULATORY SANDBOXES IN PRACTICE

Regulators around the world are experimenting with sandbox-inspired programs for supporting responsible FinTech innovation. This includes a number of sandboxes specifically dedicated to testing financial inclusion solutions, which are further outlined in Section 2.2.2. To date, at least two discernible models have emerged: (1) product testing sandboxes and (2) policy testing sandboxes. The lines between the two are not rigid; there is emerging evidence of policy testing within product-focused sandboxes, particularly in the context of thematic cohorts. A third distinct model, multi-jurisdictional sandboxes, may adopt elements of product or policy testing sandboxes, depending on the context.

Product testing sandboxes

Product testing sandboxes use the sandbox process as a safe zone to allow innovators to live test new products prior to formal licensing or registration. Participants gain feedback on their service or business model, assess consumer uptake, and refine product features to address regulatory feedback. As the UK FCA explains, "Many firms use a sandbox test to assess consumer uptake and commercial viability… Testing the viability of underlying technology is another common objective amongst sandbox firms" (FCA, 2017a). If the product is economically viable, it is typically allowed to launch on the wider marketplace, either under an existing licensing regime or a bespoke accommodation. The objective of such sandboxes is to allow the product to see the light of day with a lower initial regulatory burden. The primary output of a product testing sandbox is the launch of a financial service into the marketplace under either an existing or a modified license. An example of a modified license regime emerging from a product testing sandbox is that of BNM, detailed in Section 2.2.2.

Policy testing sandboxes

In contrast, policy testing sandboxes use the sandbox process to evaluate regulations or policies that may impede beneficial new technologies or business models. As the leading proponent of this approach, MAS describes its sandbox as a mechanism for evaluating whether particular rules or regulations should be changed based on specific use cases.[28] The testing process then evaluates a specific regulatory hypothesis, i.e., whether a specific rule or regulation should change in light of a specific test result, rather than the commercial viability of the underlying technology. The sandbox becomes the final step in a regulatory continuum, which begins with informal guidance on regulatory uncertainties and ends with a test to determine whether the business model requires modification of an existing rule or regulation. The primary output of a policy testing sandbox is then the revision, cancellation, or endorsement of a legacy rule or policy.

As observed above, the lines between the two types of sandboxes may be blurred. Almost all regulatory sandboxes, including product testing sandboxes, have some element of regulatory uncertainty in the testing process and may, therefore, provide some of the benefits of policy testing sandboxes. Similarly, policy testing sandboxes will, in reality, also function as product testing sandboxes for participating firms.

Multi-jurisdictional sandboxes

The sandbox concept is being actively explored to promote cross-border regulatory harmonization and enable innovators to scale more rapidly on a regional or global basis. Multi-jurisdictional sandboxes may be attractive for consumers and regulators alike (Herrera and Vadillo, 2018). Close to 20 percent of all FinTech in the Latin America-Caribbean region operates in more than one jurisdiction—most likely because individual regional markets may be too small (Inter-American Development Bank and Finnovista, 2017). For many innovators, the ability to deliver a financially sustainable solution requires a scale beyond the reach of country-level markets. In theory, therefore, multi-jurisdictional sandboxes may facilitate cross-border expansion through shared testing programs and reduce the potential for

28 Interview with Sopnendu Mohanty, Monetary Authority of Singapore, August 2018.

regulatory arbitrage across individual sandbox jurisdictions (EBA, 2018b). Multi-jurisdictional sandboxes can operate as product testing or policy testing sandboxes—or both.

Two multi-jurisdictional sandboxes are currently underway:

- Global Financial Innovation Network (GFIN). Originally proposed as a "global sandbox," GFIN facilitates knowledge transfer and learning across its stakeholders[29] on shared issues of concern, including RegTech, anti-money laundering/combating the financing of terrorism (AML/CFT) initiatives, and new product trials for innovative companies expanding across borders. Like many of the early individual sandbox initiatives, GFIN draws largely from advanced economy regulators, although it may eventually mature to include a greater financial inclusion focus.[30]
- The API Exchange (APIX). Launched by the ASEAN Financial Innovation Network (AFIN), APIX is a cross-border, open-architecture platform to improve financial inclusion. APIX enables financial institutions and FinTech firms to connect through a cross-border marketplace, conduct collaborative experiments in a sandbox among financial industry participants, and facilitate adoption of APIs to drive digital transformation and financial inclusion across the Asia Pacific region.

The resources required to design and implement a regulatory sandbox vary according to local market context and the specific parameters of each. A multi-jurisdictional sandbox may offer economies of scale through multiple regulators operating the sandbox together. However, the initial resources required in the design stage may be significant, given the challenges in developing a sandbox framework across multiple jurisdictions. A policy testing sandbox may be less resource intensive than a product testing sandbox if the regulator admits only a small number of firms to test a policy. This is not a strict rule as regulators may admit any number of firms to a sandbox. Ultimately, regulators select the regulatory sandbox model that best suits their needs.

Sandboxes also connect financial institutions with FinTech start-ups around the world. The Inter-American Development Bank (IDB)-sponsored FinConecta is perhaps the best example of this, as it integrates financial institutions in Latin America and the Caribbean with FinTechs around the world.[31]

2.2.2 REGULATORY SANDBOXES AND FINANCIAL INCLUSION

As evidenced by Figure 7 above, regulatory sandboxes seem to have tremendous intuitive appeal. However, as a recent regulatory phenomenon there is lack of empirical evidence of their impact to date, including with respect to financial inclusion. Despite this, regulatory sandboxes have the potential to advance financial inclusion in a number of ways.

Directly promoting financial inclusion

While sandboxes may support a range of regulatory and policy objectives, several jurisdictions have launched sandboxes to foster market development that advances financial inclusion. Inclusion-linked sandboxes have been launched in Bahrain, Malaysia, and Sierra Leone, while others are in various stages of planning.[32] They are often linked to an NFIS[33] or statutory mandates[34] that allow the sponsoring regulator to pursue market development activities that promote inclusion (see Figure 8).

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29 Current stakeholders include Abu Dhabi Global Market, Autorité des Marchés Financiers, Australian Securities and Investments Commission, Central Bank of Bahrain, Consultative Group to Assist the Poor, Consumer Financial Protection Bureau, Dubai Financial Services Authority, Financial Conduct Authority, Guernsey Financial Services Commission, Hong Kong Monetary Authority, Monetary Authority of Singapore, and Ontario Securities Commission.

30 While GFIN is at an early stage, the launch consultation document refers to the financial inclusion dimensions of promoting financial innovation (FCA, 2018c).

31 FinConecta provides a platform and program through which FinTechs and financial institutions can integrate with one another (IDB, 2017).

32 This includes India, Jamaica, Kenya, Mexico, Sri Lanka, and Uganda.

33 Uganda is a good example of a country which has linked the development of a regulatory sandbox to its NFIS (Bank of Uganda, 2017).

34 Mexico is a good example of a country which has linked the development of a regulatory sandbox to a financial inclusion mandate through its FinTech Law.

Figure.8: Financial Inclusion Sandboxes

Regulator	Inclusion Objective	Status
Central Bank of Bahrain	"[T]o promote effective competition, embrace new technology, encourage financial inclusion and improve customer experience."	In process
Bank Negara Malaysia	"[T]o promote a sound, progressive, and inclusive financial system."	59 applicants 7 firms in testing 1 graduate
Bank of Sierra Leone	"[T]o foster responsible innovation that benefits consumers in Sierra Leone by improving the quality of, and access to, financial products and services."	First cohort announced May 2018

Sources: Central Bank of Bahrain www.cbb.gov.bh/page-p-regulatory_sandbox_application_authorizations_by_the_central_bank_of_bahrain.htm, Bank Negara Malaysia www.myfteg.com, BSL (2018)

Supporting the development of regulatory enablers of financial inclusion

Potentially more significant than facilitating inclusion-oriented innovations, sandboxes may be used to develop a broader enabling environment[35] for inclusive innovation.

More than 50 percent of the regulators interviewed for this report privately mention that it is difficult to develop the required depth of knowledge of the FinTech space to inform sound policymaking. Sandboxes provide a tool for regulators to collaboratively engage in marketplace innovation, probe the risks and benefits of emerging technology, and develop long-term policy from a more informed position.

At least three jurisdictions have begun to explore thematic sandboxes focused on products or enabling technologies with particular salience to inclusive financial ecosystems, including electronic know your customer (eKYC), QR codes, and small business finance, as set out in Figure 9. The linkages between such initiatives and eventual financial inclusion impacts (and the role of sandboxes in amplifying or moderating those linkages) warrants further observation and study.[36]

Figure.9: Thematic Sandboxes

Regulator	Inclusion Objective	Status
Abu Dhabi Global Market	Enhancing access to financial services for the small-medium enterprise sector	Cohort application closed
Bank of Thailand	QR code standard for e-payments	Eight financial institutions admitted to test their payment projects using the QR code standard through their mobile application in the BOT's regulatory sandbox
Japan Financial Services Agency	KYC-related technology	Four financial institutions admitted in November 2017 to jointly test blockchain-based POC Two financial institutions admitted in March 2018 to test eKYC using facial recognition technology

Sources: JFSA (2017, 2018) and BoT (2017)

35 See Section 1.2 and Chapter 3 for further detail on the enabling environment for inclusive innovation.
36 Sandboxes primarily intended to advance the traditional objectives of stability, integrity, and protection may nevertheless advance financial inclusion by creating connections between innovation and I-SIP objectives.

Around a dozen regulators have used, or are planning to use, sandboxes to identify and remove potential frictions caused by existing rules or regulations that may inadvertently inhibit inclusive financial innovation. BNM's experience with the UK-based remittance company, WorldRemit, is an often-cited example of sandbox testing that resulted in meaningful policy change. At the time, Malaysian law required KYC checks to be conducted in person—a significant barrier to online account openings, particularly in rural areas.

The sandbox allowed WorldRemit to operate its eKYC solution in a controlled environment under the supervision of the bank. The test was well received by customers and the bank was comfortable with the efficiency of the remote KYC solution. As a result, the bank amended its KYC regulations to permit remittance providers to verify customer identities via "selfie" and other remote identifiers (BNM, 2017b). Perhaps more importantly, sandbox programs may enable cultural change within a regulator by providing a focal point for formal and informal interactions with market participants. This is a feature they share with innovation offices.

Sandboxes can give innovators the opportunity to understand the expectations of playing on a bounded field, and reduce the time, costs, and uncertainty of launching a new product into the regulated financial sector (FCA, 2017a; ASIC, 2018). Sandbox tests can help participants gather valuable regulatory input on design, evaluate strategy, and devise potentially "safer" product features (FCA, 2017a). Tests may also broker partnerships between innovators and facilitate access to capital.

Figure 10 below summarizes the potential benefits of regulatory sandboxes in general, which may, in turn, promote financial inclusion.

Figure.10: Regulatory Sandbox Benefits

Regulator	Innovators	Consumers
• Inform long term policy making through learning and experimentation • Signal commitment to innovation and learning • Promote communication and engagement with market participants • Update regulations that may prohibit beneficial innovation	• Reduce time-to-market by streamlining the authorization process • Reduce regulatory uncertainty, such as that new technologies and business models will be prohibited • Gather feedback on regulatory requirements and risks • Improve access to capital	• Promote introduction of new and potentially safer products • Increase access to financial products and services

Sources: CCAF & AIF, Zhejiang University (2018), Jenik and Lauer (2017), and UNSGSA FinTech Working Group and CCAF (2019)

2.2.3 REGULATORY SANDBOXES – LESSONS LEARNED

Although it is still too soon to quantify their impact on financial inclusion, the emerging community of practice[37] around regulatory sandboxes has yielded a number of lessons for current and aspiring sandbox sponsors, especially in emerging and developing economies. Annex 7 contains an in-depth case study of the Bank of Sierra Leone's (BSL) regulatory sandbox.

Regulatory sandboxes are neither necessary nor sufficient for promoting financial inclusion

Early critiques of sandboxes focused on the risk of allowing new companies to operate in the market without appropriate oversight. A deeper concern, however, may be that regulators prioritize resource-intensive sandbox programs over more comprehensive innovation policies, market engagement strategies, or financial inclusion programs.

37 The current community of practice includes those jurisdictions with operational sandboxes, as set out in Figure 7. The most prominent and earliest regulatory sandboxes include those in Australia, Hong Kong, Malaysia, Singapore, Thailand, and the UK.

The costs of regulatory sandboxes vary substantially by regulator and across the design and operational stages. Given the blurred lines between product and policy testing sandboxes, it is also unclear which model is less resource intensive. The design stage alone can be highly resource intensive. The development of a regulatory sandbox in one developing economy has taken 18 months to date. The process has involved extensive public consultation and market landscaping. It has also involved significant internal consultation, estimated at around six days each for 10 to 15 members of senior management and a three-day workshop for around 18 staff members. Even in advanced markets the development of a regulatory sandbox typically requires a minimum of at least six months.

Costs may decrease in the operational stage, but this is not a certainty. Almost two thirds of those regulators interviewed noted that they had significantly underestimated the resources required to develop and operate their sandboxes. One regulator in an emerging economy acknowledged that its sandbox team quickly became overwhelmed by the number of applications. The UK FCA also advised that the total applications for the first cohort of its regulatory sandbox far exceeded expectations (Woolard, 2016a).

One regulator in an advanced economy had the equivalent of 10 full-time staff supporting the sandbox function. Another had just one full-time staff member running the sandbox, consequently resulting in constrained impact. The BSL, a regulator in a developing economy with capacity constraints and a relatively new FinTech ecosystem, has three full-time staff and a significant support function running its sandbox, including senior management.

Anecdotal evidence from operational sandboxes suggests that around a quarter of regulators have launched sandbox initiatives without first evaluating feasibility, demand, potential outcomes, or collateral effects. Some initiatives may be motivated by a desire to remain competitive on this high-profile indicator of regulatory innovation rather than a clear vision of sandbox impact on financial inclusion. While it may be relatively straightforward to announce a sandbox framework, the objectives and risks should be carefully evaluated before launching these resource-intensive initiatives.

As observed above, a recent FinTech market landscaping by the Kenya Capital Markets Authority revealed that an innovation office or "hotline" would go a long way in resolving regulatory questions of start-ups (FSD Kenya, 2018). Experience shows that most regulatory questions raised in connection with sandbox tests can be effectively resolved without a live testing environment. For example, MAS provided guidance to 140 organizations in connection with its regulatory sandbox. This produced 40 applications, approximately 30 of which were later withdrawn or allowed to proceed without the need for a sandbox.[38]

Likewise, proportional or risk-based licensing regimes and regulations[39] may help lower the costs of regulatory compliance for FinTech start-ups and, unlike sandbox testing programs, are available to all market participants on a class-wide basis. Therefore, while sandboxes may be an important tool for developing evidence-based policy, they should not distract regulators from pursuing other avenues and tools for engaging with market participants[40] and adopting more fundamental regulatory enablers[41] to advance financial inclusion.

The following questions may assist regulators considering the development of a regulatory sandbox:

- If the goal is to facilitate greater engagement with the local innovation community, how will the sandbox relate to other market outreach programs? What value will it bring to those efforts? Can an

38 Interview with Sopnendu Mohanty, Monetary Authority of Singapore, August 2018.
39 A proportional or risk-based approach generally implies simpler rules for small, less complex financial institutions, but can also take the form of additional regulations for large and more complex institutions.
40 Such as innovation offices.
41 Such as wider and more wholesale regulatory reforms.

innovation office perform the role instead, perhaps with fewer resources?

- If the goal is to reduce regulatory barriers for innovators, can this be accomplished through proportional or regulation or risk-based licensing that applies on a market-wide basis?
- If the goal is to deepen regulatory understanding of particular technologies or business models to inform new regulation or guidance, is an applicant-driven sandbox the most effective way to collect and curate those insights?

Sandbox processes can be streamlined to reduce review and processing time

Reflecting on their own sandbox initiatives, regulators privately reported that they were unprepared for the level of effort and resources required to process sandbox applications and develop testing plans. Based on these experiences, they have begun experimenting with a streamlined application process, improved applications, and expanded communication channels. Singapore, for example, has recently introduced the Sandbox Express, which is the creation of pre-defined sandboxes to speed up approvals for low-risk experiments (MAS, 2018b).

Jurisdictions such as Canada have mandated pre-application conferences to assess sandbox fit (CSA, 2017). The Hong Kong Monetary Authority (HKMA) launched the FinTech Contact Point to encourage market participants to discuss their application via email, video conferencing, or face-to-face meetings (HKMA, 2018). BNM has also begun to explore how it can reduce processing time on high volumes of applications.[42]

Thematic sandboxes are emerging as tools to support financial inclusion

For regulators with a financial inclusion mandate, thematic sandboxes are a way to support inclusive financial innovation either directly or by targeting enabling technologies or services. The BSL's regulatory sandbox explicitly promotes financial inclusion. It is linked to the country's NFIS and sandbox applicants must demonstrate how their innovation will domestically advance inclusion. A sandbox cohort hosted by the Bank of Thailand led to the development and use of QR code technology for electronic payments, promoting financial inclusion (BoT, 2017).

Regulatory coordination is essential, particularly in multi-peak jurisdictions

In multi-peak jurisdictions,[43] FinTech innovations often fall within the supervisory scope of different regulators. Even in jurisdictions with multiple regulatory sandboxes hosted by different prudential regulators, there is often no coordination mechanism to allow all authorities to work together on applications and tests.

Hong Kong has experienced the benefits of improved regulatory coordination. Previously, the Monetary Authority, the Securities and Futures Commission, and the Insurance Authority had independent regulatory sandboxes, which made it difficult to test products that spanned jurisdictions. Linking up the three sandboxes provided a single point of entry for FinTech product trials. The number of firms testing across the three sandboxes has now significantly increased.

The importance of senior leadership and institutional engagement are critical to sandbox initiatives

Executive leadership and institutional support are essential to any sandbox initiative. Because sandbox activities cut across departments and require new capabilities and collaboration, they may be met with scepticism and resistance. Obtaining clear support from figures of authority encourages alignment among internal stakeholders. Sandbox champions also communicate purpose and goals across internal divisions and ensure appropriate staffing.

The BSL's regulatory sandbox benefited from deep institutional engagement from the outset, beginning with the Office of the Governor, and the significant commitment of resources, including a full-time, cross-functional team. Annex 7 provides further details.

42 Interview with Bank Negara Malaysia, August 2018.
43 A multi-peak jurisdiction is one which has multiple financial services regulators.

2.3 REGTECH

RegTech is an increasingly important tool for regulators to consider as they innovate and promote financial inclusion. While the term "RegTech" encompasses all technologies used for regulatory purposes—whether by regulators or regulated institutions—it was first conceptualized to describe compliance technology used to aid those subject to regulation. First-generation RegTech primarily focused on helping large and well-resourced financial firms reduce compliance costs.

However, the past few years have seen a broadening of RegTech's definition and its market. Regulators themselves have begun to consider RegTech as a tool to help keep up with the substantial changes in financial services marketplaces. Current literature suggests considering RegTech as two "distinct but complementary branches: compliance technology (CompTech) and supervisory technology (SupTech)" (Mueller and Murphy, 2018). Although useful, this distinction may reflect more a difference in clientele than substance, given the need for RegTech solutions to successfully sit between regulators and firms they regulate.

There are clearly many ways to describe RegTech, including definitions put forward by the Bank for International Settlements (BIS), the Toronto Centre, and others.[44] This report focuses on the usefulness of *RegTech for regulators:* for any objective they might have and with any technology that might help them better regulate and supervise a rapidly digitizing financial marketplace. Whenever the term "RegTech" is used in this report, it refers to this concept.

RegTech is unique compared to the other innovative regulatory initiatives previously discussed for at least three notable reasons. First, while the other initiatives may help regulators determine *which* set of activities to include within their scope, RegTech focuses on *how* to monitor and enforce compliance of those activities against relevant regulations. In this way, RegTech creates opportunities for new ways to regulate the financial sector in the digital era.

Second, RegTech is not yet a common term among regulators and, even when they undertake efforts that fall within this report's definition of RegTech, they can be difficult to pinpoint. This is in contrast with the terms "sandbox" and "innovation office." Their wide adoption and use makes it easier to actively track those efforts.

Third, regulators must often overcome significant inertia within their organizations to set up the preconditions required to meaningfully use RegTech. They may need to upgrade existing technology, including data infrastructure, and navigate difficult procurement requirements in the process. Trusted machine-readable data is another important component. Regulators must also attract relevant staff and align organizational culture toward innovation.

As a result of these factors, significant adoption of RegTech is a longer-term proposition that often develops over a more extended time frame than other initiatives described in this report. However, RegTech may prove to be a longer lasting solution, due to its potential to help regulators adapt to a changing marketplace. As regulators search for solutions to similar challenges and learn from each other, they may decide to jointly develop shared utility solutions.

2.3.1 REGTECH IN PRACTICE

While RegTech adoption by regulators is still in the early stages, a number of effective engagement models are emerging. Figure 11 below illustrates some of the jurisdictions around the world that have pioneered RegTech models and the principal technologies they employ. Annex 5 provides further details on these initiatives.

44 The Bank for International Settlements definition of RegTech focuses on SupTech, defining it as the use of innovative technology by supervisory agencies to support supervision (BIS, 2018). The Toronto Centre defines RegTech as focusing on technology-based solutions to attenuate or solve regulatory and supervisory challenges, including the challenges posed by the expansion of FinTech (Toronto Centre, 2017).

Figure.11: Examples of Global RegTech Initiatives by Jurisdiction

Sources: BIS (2018), R²A, BCFP, BoE, Toronto Centre (2017), World Bank (2018), UNSGSA FinTech Working Group and CCAF (2019)

One model that has emerged to help regulators in emerging and developing economies improve their effectiveness through technology is the RegTech for Regulators Accelerator (R2A), established in 2016 by the Gates Foundation, Omidyar Network, and the U.S. Agency for International Development (USAID).

R2A has partnered with two regulatory authorities—the Bangko Sentral ng Pilipinas (BSP) in the Philippines and the Comisión Nacional Bancaria y de Valores (CNBV) in Mexico. The program helps regulators experiment with RegTech through a process that is similar to a FinTech accelerator.[45] R2A offers technical support and guidance, a phased approach to defining problems and finding solutions, and a neutral platform that encourages regulators to engage with RegTech firms.

As part of the program, the CNBV developed a new data infrastructure for AML supervision, which will enable further growth of Mexico's FinTech sector. New tools developed through the program will help the CNBV responsibly open the market to new players, including those targeting inclusive financial innovation. In a recent case study produced by R2A, the President of the CNBV described this work as a "key step in enhancing our ability to uncover and identify suspicious activities, preserving the integrity of the financial system, and welcoming those who have been financially excluded to participate in this rapidly evolving ecosystem" (di Castri et al., 2018c).

The BSP's engagement with R2A has also demonstrated the financial inclusion potential of RegTech. The subject of a longer case study within this report (see Annex 8), efforts have

45 An accelerator is an intensive business development program that supports start-up founders and helps them turn their ideas into successful businesses. Support typically comes in the form of mentorship, working space, and initial capital.

focused on APIs for regulatory reporting and a chatbot to improve consumer interactions. These RegTech solutions potentially lower compliance costs and enable customers to more effectively resolve issues with the bank.

Several other regulators have demonstrated how RegTech can improve effectiveness and lead to positive financial inclusion outcomes.

In the UK, the FCA supports technology for industry compliance and RegTech to improve its own effectiveness. RegTech has been employed to improve its regulatory handbook and enable machine-readable regulation. The FCA also surfaces new ideas through "TechSprints," which its Head of RegTech and Advanced Analytics, Nick Cook, describes as "two-day events that bring together participants from across and outside of financial services to develop technology-based ideas or proof of concepts" (Barefoot Innovation, 2018). These efforts contribute to a more conducive environment for private sector investment, which can lead to greater competition and better consumer options.

The Bank of England (BoE) has also closely engaged with innovators through feasibility testing to better understand how emerging technologies can improve operations. Examples include using ML techniques to process big data, and AI and ML to detect inconsistencies in transactions and reports.[46]

The MAS established a Data Analytics Group in 2017. One of the Group's initiatives focused on developing a shared service utility to enhance KYC checks, improve the quality of risk management, and reduce time and costs. Reduced KYC costs can foster financial inclusion by making onboarding less expensive for institutions.

India's new digital infrastructure efforts also include RegTech components. A government-run electronic KYC utility, for example, enables banks and other financial institutions to confirm the identity of potential customers at a fraction of previous costs. This helps Indian authorities ensure compliance with KYC requirements and was made possible by the government's decision to pursue a national identity system.

Similar to the BSP use case, the National Bank of Rwanda (BNR) developed an automated means for capturing supervisory data. According to a recent report by the BIS, the system can capture "data directly from the IT systems of more than 600 supervised financial institutions, including commercial banks, insurance companies, microfinance institutions, pension funds, forex bureaus, telecom operators and money transfer operators" (BIS, 2018). In some instances data are pulled as frequently as every 15 minutes. In addition to improving transmission, data quality, integrity, and reliability have also improved.

2.3.2 REGTECH AND FINANCIAL INCLUSION

As observed above, RegTech is distinct because it focuses on *how* regulators monitor and enforce compliance. It can also ensure that innovative financial services are delivered in a responsible way, thereby directly impacting financial inclusion (World Bank, 2018).

Supervising institutions

Regulators can use RegTech to ensure compliance and to keep up with the technology transformations that are changing the industry. RegTech's impact is most visible in regulatory data collection and analysis efforts, where it aids human decision-making. For example, the BSP's use of API-based regulatory reporting provided greater real-time visibility on the conditions of supervised institutions, enabling them to act swiftly when necessary. The Central Bank of Brazil (BCB) also implemented a web-based RegTech solution to allow the easy and secure sharing of information between the regulator and providers. The system collects data to assess risks and controls, and supports the supervisory process through report generation (World Bank, 2018).

46 https://www.bankofengland.co.uk/research/fintech/proof-of-concept

Monitoring the marketplace

RegTech can help regulators improve how they monitor the financial services marketplace. Just as the API-based tool previously mentioned helps BSP better oversee individual institutions, data can also be visually aggregated to provide a real-time snapshot of the entire market. Monitoring allows regulators to spot systemic risks and other forms of consumer harm that may extend beyond a single institution. Similarly, the BCB's RegTech solution helps determine which institutions require the closest monitoring, which may also save scarce supervisory resources (World Bank, 2018).

Protecting customers

Regulators can use RegTech to engage more directly with consumers to ensure that they are properly protected. Technology is an increasingly essential tool in this area as the share of the population served grows and consumers represent broader segments of society, including hard-to-reach rural populations. The Bureau of Consumer Financial Protection (BCFP) in the U.S., for instance, developed a consumer complaint portal and database that makes it easier for consumers to report issues and provides greater public visibility on consumer trends. The Bank of Lithuania has similarly introduced an electronic solution to complaints handling and dispute resolution. Data captured, in turn, inform better institutional supervision (World Bank, 2018). A final example is the BSP's chatbot solution, which has the potential to promote consumer protection through better oversight of consumer complaints and firm behavior.

Supporting rulemaking

Improved data collection and analysis on the part of RegTech can help generate insights that lead to rule refinement and guidelines that contribute to financial inclusion. Improved AML data and analysis, for example, can help regulators refine tiered KYC requirements in a risk-based, inclusive manner. Improved data infrastructure, as illustrated by the work of the CNBV, may also contribute to such an initiative.

2.3.3 REGTECH – LESSONS LEARNED

As the financial services industry continues to become more technology driven, it is clear that regulators need to retool to keep up. RegTech will likely become an increasingly important way to do so. However, compared to other regulatory innovations, it will take regulators longer to implement RegTech and see tangible financial inclusion results. While RegTech is still in its early stages, lessons are emerging from regulators and governments that have begun to adopt new technology.

Executive sponsorship matters

Support from senior leadership, ideally from the head of an organization, is often critical to a mandate to test new ideas. It is particularly important in capacity-constrained environments where resources are at a premium.

Active interest and prioritization by leadership can signal importance to other stakeholders within an organization but it must be constantly cultivated. For this reason, R2A requires a signature from the head of the organization as well as another executive sponsor before the regulator may join the program. R2A also requires executive buy-in on a granular level through a project charter that is co-developed and signed by both parties. The BSP provides another good example of executive sponsorship, with the governor and other senior executives actively engaged both publicly and internally.

Broad-based stakeholder buy-in can pay dividends

While executive sponsorship can be critical, it is often not enough to sustain organizational support. It requires a coalition of champions. One way to achieve this is to focus on issues that are widely felt and likely to gain broad buy-in. It also helps to concentrate scarce resources where they will have the most impact. The Government of India took this approach when building its Aadhaar digital identity program. The program was positioned to solve a number of problems felt across government, including social security fraud. It was not presented as a competitor to existing programs.

Match solutions to problems

Correctly identifying the right problem is an essential prerequisite to developing solutions. Regulators must carefully define the problems they seek to address and identify root causes. Without a clear understanding of the problem, a technology solution may solve the wrong one. There is also a risk of finite resources being devoted to problems that are much smaller in scale than others.

R2A works closely with regulators to understand the nature of the problems they face. Regulatory "pain points" are diagnosed at an early stage during in-country workshops, followed by identification and crafting of potential solutions. R2A and the BSP used this analytical framework to identify the chatbot solution as the most valuable. The efficiency gained by streamlined complaints handling also freed up resources for other projects (di Castri et al., 2018).

The benefits of multi-disciplinary teams

While technology talent is important, successful efforts require other skill sets, such as individuals who can effectively navigate an organization to remove barriers and storytellers who can craft compelling narratives for internal and external audiences. A growing number of digital transformation teams in governments across the world have demonstrated that multi-disciplinary teams with complementary skill sets are essential to fostering long-term change in new technology adoption. By way of example, the U.S. Digital Service (USDS) seeks engineers, designers, product managers, recruiters, procurement experts, and others as part of the recruitment process.[47] This same thinking can be important to regulators planning to take on a transformative RegTech agenda.

Success can bring about further success

Regulators can benefit from beginning with a problem that has broad support and a high likelihood of successful resolution. This generates momentum, helps overcome initial inertia, and decreases internal scepticism. Developing a strategy that can be refined over time has proven to be more effective than detailed plans that may not work out. The BoE demonstrated how small experiments can lead to larger transformations when it began experimenting to learn more about RegTech. Testing led to the conclusion that the bank needed a more transformative agenda to reimagine its digital infrastructure.

Crowdsourcing solutions can surface novel ideas

Engaging the public to help develop potential solutions can attract new perspectives, skill sets, and businesses. It can also help identify solutions that may not have emerged through standard procedures. There are many opportunities for regulators to engage with innovators, including the FCA's TechSprint model. TechSprints bring together participants from inside and outside the financial services industry to develop technology-based ideas on a specific topic. Previous TechSprints have focused on financial inclusion, regulatory reporting, and financial crime.[48] Three of the ideas generated at the financial inclusion TechSprint are now being further explored.[49]

Culture and procedural challenges must also be addressed

While technology is an important enabler for the future of regulation, it cannot and will not solve all problems. Even when technology is a critical part of a solution, it is important that regulators address other preconditions for success. More challenging than the technology itself is often the imperative to address culture and process barriers (such as procurement rules) to utilizing new technology. In recognition of these issues, digital transformation teams from countries such as Italy and the U.S. have taken steps to streamline procurement and remove other process barriers to the adoption of new technology.

47 https://www.usds.gov/join#who
48 https://www.fca.org.uk/firms/regtech/techsprints
49 https://www.fca.org.uk/events/techsprints/consumer-access-techsprint

Chapter 3: Implementation Considerations

Many of the innovative regulatory initiatives described above are still in the early stages of development. Many are resource-intensive and divert resources away from other priorities. Empirical data are limited, including on impacts on financial inclusion. However, it is clear that no single initiative is a "silver bullet" for the effective regulation of inclusive financial innovation. In many emerging and developing economies, the most impactful actions regulators can take may be more "traditional"[50] rather than innovative.

Regulators should first consider their wider role in the preconditions for inclusive FinTech. One useful resource is the G20 HLP for Digital Financial Inclusion,[51] which provides the basis of action plans that take into consideration local context and national circumstances (G20, 2016). The UNSGSA FinTech Working Group has also identified an initial set of policies and infrastructure that can enable inclusive, thriving FinTech, which they defined as key prerequisites (UNSGSA, 2017). The list of key prerequisites includes data privacy, cybersecurity, digital identification, connectivity, interoperability, financial and digital literacy, fair competition, and physical infrastructure such as agent networks.

The following 10 Implementation Considerations are designed for regulators who have carefully considered the preconditions noted above and plan to develop their own initiatives.[52] They are based on empirical evidence gathered throughout this study,[53] as referenced in Chapter 2. Regulators should consider their own specific market and circumstances prior to adoption. The MAS case study in Annex 9 further illustrates the considerations.

Implementation Consideration 1: Conduct a feasibility assessment that focuses on capacity and objectives

Innovative regulatory initiatives can be challenging and resource intensive to design and implement. A feasibility assessment may help determine whether benefits outweigh costs, and whether the existing regulatory framework is fit for the purpose or if changes are needed.

Regulatory authorities in Kenya adopted such an approach when mobile money emerged in the country. Rather than developing regulations that may not match risks, the central bank and the telecommunications regulator issued a letter of no objection. Mobile money products and services got the go-ahead once certain conditions were met, including consumer safeguards, money laundering controls, and adequate record-keeping. The approach required significantly fewer resources, and further monitoring and assessment resulted in more detailed regulation at a later stage.

50 For the purpose of this report we use "traditional" to mean traditional regulatory approaches, for example, introducing new guidelines, consulting with industry, or conducting industry research.
51 The G20 High-Level Principles are: 1. Promote a Digital Approach to Financial Inclusion, 2. Balance Innovation and Risks to Achieve Digital Financial Inclusion, 3. Provide an Enabling and Proportionate Legal and Regulatory Framework for Digital Financial Inclusion, 4. Expand the Digital Financial Services Infrastructure Ecosystem, 5. Establish Responsible Digital Financial Practices to Protect Consumers, 6. Strengthen Digital and Financial Literacy and Awareness, 7. Facilitate Customer Identification of Digital Financial Services, and 8. Track Digital Financial Inclusion Progress.
52 These considerations complement the G20 High-Level Principles for Digital Financial Inclusion (G20, 2016).
53 These considerations reflect the 10 issues in the FSB report (2017) and the BCBS (2018) sound practice report.

Implementation Consideration 2: Engage with a wide range of relevant stakeholders; consult to identify challenges and crowdsource solutions

When developing initiatives, regulators can benefit from engaging with stakeholders such as individual firms, industry and consumer associations, government departments, and regulatory authorities. Consulting with stakeholders to identify and crowdsource solutions has proven to be a good practice.

BSP found that engaging with new types of technology providers was crucial to their success as part of R2A. Engagement led to the development of a RegTech prototype for gathering better data and a consumer complaints chatbot that also has the potential to crowdsource data and insights, helping to identify barriers to inclusive financial innovation. Annex 8 provides further details on BSP's experience.

Implementation Consideration 3: Ensure executive buy-in and institutional support, focusing on mindset and culture

Innovative regulatory initiatives are more likely to succeed when strong buy-in from senior leadership is coupled with institution-wide support. These enablers of a pro-innovation mindset and culture are critical to effective implementation.

The BSL benefited from institutional engagement with its sandbox from the outset, including strong political support from the Office of the Governor. The Bank also had a dedicated taskforce to operationalize the initiative, a dedicated sandbox team, and a sandbox committee for oversight and support. This enabled organizational buy-in and a pro-innovation mindset. Annex 7 contains further detail on the BSL's regulatory sandbox.

Implementation Consideration 4: Sequence and combine a variety of approaches for regulatory innovation

Sequencing the design and implementation of innovative regulatory initiatives requires careful consideration. Some initiatives are naturally suited to authorities in the initial stages of regulatory innovation while others may benefit from pre-existing initiatives and infrastructure.

The MAS's FTIG innovation office, for example, is comprised of three offices in charge of payments policy and solutions, infrastructure, and ecosystem development. The MAS has subsequently launched other initiatives such as a sandbox, the Global FinTech Hackcelerator, exploration and development of RegTech, and an activity-based Payment Services Bill.

Implementation Consideration 5: Start small, experiment often, and gain quick wins

Implementing an innovative regulatory initiative is not a straightforward process and may require considerable institutional resources to succeed. Demonstrating early wins can be an impetus for further action.

The CNBV in Mexico tested small-scale solutions by participating in the R2A program, with a focus on AML-related data infrastructure development. Undertaking small, quick experiments generated momentum and enabled the authority to better understand technology and gather valuable learnings along the way (di Castri et al., 2018c).

Implementation Consideration 6: Be adaptable, flexible, and open to refining the approach

Technology-enabled financial innovation is fluid, and innovative regulatory initiatives frequently benefit from flexibility. Many regulatory authorities have benefited from refining their initiatives based on need.

When the HKMA's first-generation regulatory sandbox experienced lower-than-expected uptake, for example, the authority quickly moved to improve upon it. Stakeholder engagement revealed that the sandbox should cater to both incumbent and new firms. Uptake of the second-generation sandbox was markedly higher.[54]

Implementation Consideration 7: Facilitate inter-agency coordination and collaboration

Regulatory authorities often consist of units with differing objectives, priorities, resources, and mindsets. Strong intra-agency coordination—at the national, cross-regional, and international level—can deliver effective regulatory innovation.

An example of this consideration in practice is regulators in France and the Netherlands that offer joint innovation offices to provide innovators with a single voice. Provincial securities regulators across Canada also offer a single regulatory sandbox through the Canadian Securities Administrators (CSA).[55]

54 https://www.hkma.gov.hk/eng/key-functions/international-financial-centre/FinTech-supervisory-sandbox.shtml
55 https://www.securities-administrators.ca/industry_resources.aspx?id=1588

Implementation Consideration 8: Develop a theory of impact and metrics of success

During the ideation stage, regulators need to consider how to measure their impact and review their performance, particularly with respect to financial inclusion. This consideration links to G20 HLP 8, which advocates for tracking progress in financial inclusion.

Establishing reliable measures of success can be challenging, but regulators can start by devising a set of metrics to gauge the impact of regulatory reform. R2A, for example, has developed a theory of change comprised of core inputs, outcomes targeted as a result, and how they link to overarching goals.[56, 57] R2A goals include supporting sustainable, responsible financial inclusion, together with creation of more innovative and competitive markets.

Implementation Consideration 9: Ensure proportionality

Regulators should ensure that demands on providers are proportionate to risks. BNM provides a good example of the benefits of this approach. Using its regulatory sandbox, BNM facilitated the testing of an eKYC solution. Once it was assured of the proportionality of eKYC, BNM amended regulations to allow customer identity verification via electronic identifiers.

By focusing on the substance of services rather than how they are delivered, regulators can proportionately respond to harm and minimize regulatory arbitrage. This approach allows more firms to enter the market and offer innovative products. This consideration links to G20 HLP 3, which advocates for an enabling and proportionate legal and regulatory framework for digital financial inclusion. The Central Bank of Kenya adopted regulations that allow both banks and non-banks (including MNOs) to provide mobile money services (GSMA, 2014), ensuring competition between providers.

Implementation Consideration 10: Utilize regulatory innovation to support capacity building

Innovative regulatory initiatives can improve the functioning of financial markets and promote financial inclusion. They can also build capacity within a regulator itself. This is critically important given the resource constraints of regulators in many emerging and developing economies. Innovation offices and regulatory sandboxes can promote a pro-innovation mindset and lead to new ways of doing things internally. RegTech can enable the development of the infrastructure necessary to regulate financial services in the digital age.

56 https://www.r2accelerator.org/infographics/
57 The FCA has also set out the potential channels through which its regulatory sandbox may impact the market (FCA, 2017a).

Annexes

ANNEX 1: METHODOLOGY AND LIST OF INTERVIEWEES

Under the supervision of the Office of the UNSGSA, CCAF assembled an international interdisciplinary team of researchers to collect empirical data globally. Many members of the research team have significant experience, either as regulators or having worked closely with policymakers and regulators in financial innovation and financial inclusion.

Regulatory innovation as it relates to FinTech is a relatively recent phenomenon. Many of the initiatives covered in this report are still in the early stages of development or implementation. The limited empirical data make it challenging to assess their impact. To gather as much empirical evidence as possible, the research team combined qualitative research methods with desk-based research.

This study is primarily based on semi-structured interviews with more than 40 regulators and other subject matter experts in over 20 advanced, emerging, and developing economies. Where possible, the research team conducted multiple interviews to gather data from multiple sources, verify claims, and mitigate sample bias. Complementary desk-based research was undertaken on a large number of jurisdictions and innovative regulatory initiatives around the world.

The study aims to identify lessons learned on innovative regulatory initiatives and to understand the challenges and opportunities regulators face. Besides regulators and policymakers, the research team engaged with FinTech industry leaders and key associations to obtain complementary perspectives.

Once fieldwork concluded, the empirical data were collated and analyzed to provide key findings on each initiative's impact on financial inclusion and the major lessons learned. The research team further distilled findings into Implementation Considerations to assist regulators in emerging and developing economies with their own innovative regulatory initiatives.

Finally, the UNSGSA and De Nederlandsche Bank hosted a roundtable to provide further feedback on the initial report. The meeting included senior representatives from regulatory authorities, standard-setting bodies, development partners, and FinTechs from around the world.[58] Together with a peer review process and a presentation of the advanced draft at the Singapore FinTech Festival, the roundtable informed the report's findings and considerations.

The Office of the UNSGSA and the CCAF research team would like to thank the following regulators, policymakers, and subject matter experts for providing valuable insights into the innovative regulatory initiatives discussed in this report, primarily through interviews: Yasmeen Al-Saffar (Bahrain Economic Development Board), Celine Wan Shi Ann (Bank Negara Malaysia), Azrina Azmel (Securities Commission Malaysia), Professor Shenglin Ben (Zhejiang University), Mirèl ter Braak (Autoriteit Financiële Markten), Henry Chang (Hong Kong Monetary Authority), Gordon Chapple (UK Financial Conduct Authority), Wei Min Chin (Securities Commission Malaysia), Huei Ching Wong (Securities Commission Malaysia), Clara Chiu (Hong Kong Securities and Futures Commission), Nelson Chow (Hong Kong Monetary Authority), Alan Elizondo (Bank of Mexico), Kooi Fei Foong (Monetary Authority of Singapore), Jon Frost (Financial Stability Board), Zanna Iscenko (UK Financial Conduct Authority), Rugiatu Jalloh (Bank of Sierra Leone), Ivo Jenik (Consultative Group to Assist the Poor), Cordelia Kafetz (Bank of England), Chris Kiew-

58 Almost half of the participants of the DNB-UNSGSA Roundtable on FinTech and Financial Inclusion are members of the UNSGSA's FinTech Working Group.

Smith (Abu Dhabi Global Market), Boonyarat Kittivorawut (UK Foreign and Commonwealth Office), Chandan Kumar (Reserve Bank of India), Professor Youxing Li (Zhejiang University), Buncha Manoonkunchai (Bank of Thailand), Wijitleka Marome (Bank of Thailand), Tenzin Keyzom Massally (United Nations Capital Development Fund), Manoranjan Mishra (Reserve Bank of India), Sopnendu Mohanty (Monetary Authority of Singapore), Professor Njuguna Ndung'u (Independent), Robin Newnham (Alliance for Financial Inclusion), Carlos Orta (Comisión Nacional Bancaria y de Valores), Siritida Panomwon Na Ayudhya (Bank of Thailand), Simon O'Brien (Abu Dhabi Global Market), Damien Pang (Monetary Authority of Singapore), David Parker (Bahrain Economic Development Board), Dan Quan (Independent), Rosaini Roslan (Securities Commission Malaysia), Ain Ul Mardhiah Rosli (Bank Negara Malaysia), Sudarshan Sen (Reserve Bank of India), Supawich Sirikanchana (Thammasat University, Thailand), Pia Roman Tayag (Bangko Sentral ng Pilipinas), Roy Teo (Monetary Authority of Singapore), Butree Vangsirirungruang (Securities and Exchange Commission of Thailand), Wan Malawati Wan Mansor (Bank Negara Malaysia), Poasa Werekoro (Reserve Bank of Fiji), Paul Worthington (UK Financial Conduct Authority), and Professor Dong Yang (Renmin University of China Law School).

The research team also gathered useful feedback on FinTech regulatory approaches from a number of industry stakeholders, including Sanjay Darbha (Peerlend), Andrew Dix (Crowded Media Group), Surendra Jalan (OMLP2P), Parmod Kumar (OMLP2P), Rhydian Lewis (RateSetter), Vinay Mathews (Faircent.com), Vaibhav Kumar Pandey (i2ifunding.com), Bhavin Patel (LendenClub), Thanapong Na Ranong (Beacon Venture Capital/Thai Venture Capital Association), Abhinandan Sangma (Finzy.com), Raghavendra Singh (i2ifunding.com), Gavin Wells (Digital Asset), and Arch Wongchindawest (Socialgiver/Last of Ours).

ANNEX 2: FURTHER DETAILS FOR FIGURE 4 – EXAMPLES OF INNOVATIVE REGULATORY INITIATIVES AROUND THE WORLD

Jurisdiction	Operator	Type of Initiative	Name of Initiative
Abu Dhabi	Abu Dhabi Global Market (ADGM) Financial Services Regulatory Authority	Innovation Office	Plug and Play
Abu Dhabi	Abu Dhabi Global Market Financial Services Regulatory Authority	Regulatory Sandbox	FinTech RegLab
Abu Dhabi	Abu Dhabi Global Market Financial Services Regulatory Authority	Regulatory Sandbox	Digital Regulatory Sandbox
Australia	Australian Securities and Investments Commission (ASIC)	Innovation Office	ASIC Innovation Hub
Australia	Australian Securities and Investments Commission (ASIC)	RegTech	-
Australia	Australia Transaction Reports and Analysis Centre	RegTech	-
Australia	Australian Securities and Investments Commission (ASIC) and Australian Prudential Regulation Authority	Regulatory Sandbox	Regulatory Sandbox
Austria	Oesterreichische Nationalbank	RegTech	-
Austria	Finanzmarktaufsicht (FMA)	Innovation Office	FMA FinTech Point of Contact and FMA FinTech Navigator
Bahrain	Central Bank of Bahrain (CBB)	Innovation Office	FinTech Unit
Bahrain	Tamkeen	Innovation Office	Flat6Labs
Bahrain	Central Bank of Bahrain (CBB)	Regulatory Sandbox	Regulatory Sandbox
Belgium	National Bank of Belgium and Financial Services and Markets Authority	Innovation Office	NBB Contact Point for FinTech and FSMA FinTech Contact Point
Bermuda	Bermuda Monetary Authority (BMA)	Regulatory Sandbox	Insurance Regulatory Sandbox
Brazil	Banco Central do Brazil (BCB)	Regulatory Sandbox	Laboratory of Financial and Technological Innovations
Brunei	Autoriti Monetari Brunei Darussalam	Regulatory Sandbox	Regulatory Sandbox
Brunei	Autoriti Monetari Brunei Darussalam	RegTech	-
Canada	Ontario Securities Commission (OSC)	Innovation Office	OSC LaunchPad

Jurisdiction	Operator	Type of Initiative	Name of Initiative
Canada	Canadian Securities Administrators (CSA)	Regulatory Sandbox	Regulatory Sandbox
China	China Banking Regulatory Commission	Regulatory Sandbox	Regulatory Sandbox
Cyprus	Cyprus Securities and Exchange Commission	Innovation Office	CySEC Innovation Hub
Denmark	Danish Financial Supervisory Authority (Finanstilsynet)	Innovation Office	FinTech Forum
Denmark	Danish Financial Supervisory Authority (Finanstilsynet)	Regulatory Sandbox	FT Lab
Dubai	Dubai International Financial Centre	Innovation Office	FinTech Hive
Dubai	Dubai Financial Services Authority	Regulatory Sandbox	Innovation Testing License
Estonia	Estonian Financial Services Authority – Finantsinspektsioon (EFSA)	Innovation Office	-
EU	European Banking Authority and European Commission	Regulatory Sandbox	Sandbox
Europe	European Central Bank	RegTech	-
Fiji	Reserve Bank of Fiji	Regulatory Sandbox	Regulatory Sandbox
Finland	Fianssivalvonta	Innovation Office	Innovation Helpdesk
France	Autorité des Marchés Financiers (AMF) Autorité de Contrôle Prudentiel et de Résolution (ACPR)	Innovation Office	AMF FinTech, Innovation and Competitivness division and ACPR FinTech-Innovation Unit
France	Banque de France	Innovation Office	Le Lab Banque de France
Germany	Bundesanstalt für Finanzdienstleistungsaufsicht (BaFIN)	Innovation Office	BaFin FinTech
Hong Kong	Securities and Futures Commission of Hong Kong (SFC)	Innovation Office	SFC FinTech Contact Point
Hong Kong	Hong Kong Monetary Authority (HKMA)	Innovation Office	HKMA FinTech Facilitation Office
Hong Kong	HKMA and SFC	Regulatory Sandbox	FinTech Supervisory Sandbox
Hong Kong	Insurance Authority	Regulatory Sandbox	Insuretech Sandbox
Hong Kong	Securities and Futures Commission of Hong Kong (SFC)	RegTech	-

Jurisdiction	Operator	Type of Initiative	Name of Initiative
Hungary	Magyar Nemzeti Bank	Regulatory Sandbox	-
Hungary	Magyar Nemzeti Bank	Innovation Office	MNB Innovation Hub
Hungary	Magyar Külkereskedelmi Bank	Innovation Office	MKB FinTech Lab
Iceland	Fjármálastöðugleiki	Innovation Office	-
India	State of Maharashtra	Regulatory Sandbox	Regulatory Sandbox
India	Reserve Bank of India (RBI)	Regulatory Sandbox	Regulatory Sandbox
India	Insurance Regulatory and Development Authority of India	Regulatory Sandbox	Regulatory Sandbox
India	Unique Identification Authority of India (UIDAI)	RegTech	-
Indonesia	Otoritas Jasa Keuangan (OJK)	Innovation Office	OJK Infinity
Indonesia	Bank Indonesia	Regulatory Sandbox	Regulatory Sandbox
Indonesia	Otoritas Jasa Keuangan (OJK)	Regulatory Sandbox	Regulatory Sandbox
Ireland	Central Bank of Ireland	Innovation Office	-
Israel	Israel Securities Authority, Bank of Israel, and Ministry of Finance	Regulatory Sandbox	Regulatory Sandbox
Italy	Banca d'Italia	Innovation Office	Canale FinTech
Italy	Banca d'Italia	RegTech	-
Jamaica	Bank of Jamaica	Regulatory Sandbox	Regulatory Sandbox
Japan	Japan Financial Services Agency	Innovation Office	FSA FinTech Support Desk
Japan	Bank of Japan	Innovation Office	BoJ FinTech Center
Japan	Japan Financial Services Agency and Government	Regulatory Sandbox	FinTech Proof of Concept Hub
Japan	Tokyo Metropolitan Government	Regulatory Sandbox	Regulatory Sandbox
Japan	Bank of Japan	RegTech	-
Jordan	Central Bank of Jordan	Regulatory Sandbox	FinTech Regulatory Sandbox
Kazakhstan	Astana Financial Services Authority	Regulatory Sandbox	FinTech Regulatory Sandbox
Kenya	Kenya Capital Markets Authority	Regulatory Sandbox	FinTech Sandbox
Kenya	Kenya Capital Markets Authority	RegTech	-
Latvia	Financial and Capital Market Commission	Innovation Office	Innovation Centre

Jurisdiction	Operator	Type of Initiative	Name of Initiative
Liechtenstein	Financial Market Authority	Innovation Office	Regulierungslabor
Lithuania	Bank of Lithuania	Innovation Office	-
Lithuania	Bank of Lithuania	Regulatory Sandbox	LB Chain
Lithuania	Bank of Lithuania	RegTech	-
Lithuania	Bank of Lithuania	Regulatory Sandbox	Regulatory Sandbox
Malaysia	Bank Negara Malaysia (BNM)	Innovation Office	Financial Technology Enabler Group
Malaysia	BNM	Regulatory Sandbox	Financial Technology Regulatory Sandbox
Malta	Malta Gaming Authority	Regulatory Sandbox	Cryptocurrency Sandbox
Mauritius	Economic Development Board	Regulatory Sandbox	Regulatory Sandbox
Mexico	National Banking and Securities Commission (CNBV), Ministry of Finance, and Bank of Mexico	Regulatory Sandbox	Regulatory Sandbox
Mexico	CNBV	RegTech	-
Mexico	Comisión Nacional del Sistema de Ahorro para el Retiro	RegTech	-
Mozambique	Central Bank of Mozambique and Financial Sector Deepening Mozambique	Regulatory Sandbox	Regulatory Sandbox
Netherlands	Autoriteit Financiële Markten (AFM) and De Nederlandsche Bank (DNB)	Innovation Office	InnovationHub AMF and DNB
Netherlands	AFM and DNB	Regulatory Sandbox	Regulatory Sandbox
Netherlands	DNB	RegTech	-
Nigeria	Central Bank of Nigeria and Nigeria Inter-Bank Settlement System	Regulatory Sandbox	Financial Industry Sandbox
Nigeria	Central Bank of Nigeria	RegTech	-
Nigeria	Nigeria Inter-Bank Settlement System	RegTech	-
Norway	Finanstilsynet	Innovation Office	-
Norway	Norwegian Parliament and Norgess Bank	Regulatory Sandbox	Regulatory Sandbox
Peru	Superintendencia de Banca y Seguros del Perú	RegTech	-
Philippines	Bangko Sentral ng Pilipinas (BSP)	Regulatory Sandbox	Regulatory Sandbox
Philippines	BSP	RegTech	-

Jurisdiction	Operator	Type of Initiative	Name of Initiative
Poland	Komisja Nadzoru Finansowego	Regulatory Sandbox	Regulatory Sandbox
Poland	Komisja Nadzoru Finansowego	Innovation Office	Innovation Hub Programme
Portugal	Startup Lisboa	Innovation Office	Startup Lisboa
Romania	Autoritatea de Supraveghire Financiara	Innovation Office	InsureTech Innovation Hub
Russia	Central Bank of Russia	Regulatory Sandbox	Regulatory Sandbox
Russia	Bank of Russia	RegTech	-
Rwanda	National Bank of Rwanda (BNR)	RegTech	-
Saudi Arabia	Saudi Arabian Monetary Authority and Saudi Arabia Capital Market Authority	Regulatory Sandbox	Regulatory Sandbox
Sierra Leone	Bank of Sierra Leone (BSL)	Regulatory Sandbox	Regulatory Sandbox
Singapore	Monetary Authority of Singapore (MAS)	Innovation Office	MAS Financial Technology and Innovation Group
Singapore	MAS	Innovation Office	Global FinTech Hackcelerator
Singapore	MAS	Regulatory Sandbox	FinTech Regulatory Sandbox
Singapore	MAS	RegTech	-
South Korea	Seoul Metropolitan Government	Innovation Office	Seoul FinTech Lab
South Korea	Financial Supervisory Service	Regulatory Sandbox	Regulatory Sandbox
Spain	Comission Nacional del Mercado de Valores	Innovation Office	FinTech/Innovation Portal
Spain	Spanish FinTech and InsureTech Association	Regulatory Sandbox	Regulatory Sandbox
Sri Lanka	Central Bank of Sri Lanka	Regulatory Sandbox	Regulatory Sandbox
Sweden	Finansinspektionen	Innovation Office	Finansinspektionen's Innovation Hub
Sweden	Sveriges Riksbank	RegTech	-
Switzerland	Swiss Federal Council and Swiss Financial Markets Supervisory Authority (FINMA)	Regulatory Sandbox	Regulatory Sandbox
Switzerland	Swiss Federal Council and Swiss Financial Markets Supervisory Authority (FINMA)	Innovation Office	FINMA FinTech

Jurisdiction	Operator	Type of Initiative	Name of Initiative
Taiwan	Financial Supervisory Commission	Regulatory Sandbox	Regulatory Sandbox
Thailand	Securities and Exchange Commission	Innovation Office	-
Thailand	Bank of Thailand (BoT)	Regulatory Sandbox	Regulatory Sandbox
Thailand	Bank of Thailand	RegTech	-
Uganda	Operator(s) To Be Confirmed	Regulatory Sandbox	Regulatory Sandbox
UK	Financial Conduct Authority (FCA)	Innovation Office	FCA Innovate
UK	FCA	Regulatory Sandbox	Regulatory Sandbox
UK	FCA	RegTech	-
UK	Bank of England (BoE)	RegTech	-
USA	Office of the Comptroller of the Currency (OCC)	Innovation Office	OCC Office of Innovation
USA	Commodities and Futures Trading Commission (CFTC)	Innovation Office	LabCFTC
USA	Bureau of Consumer Financial Protection (BCFP)	Innovation Office	BCFP Project Catalyst
USA	Arizona State Regulators	Regulatory Sandbox	FinTech Sandbox
USA	BCFP	Regulatory Sandbox	No-Action Letters and (proposed) BCFP Product Sandbox
USA	Securities and Exchange Commission	RegTech	-
USA	BCFP	RegTech	-
USA	Federal Reserve	RegTech	-
USA	Financial Industry Regulatory Authority (FINRA)	RegTech	-

ANNEX 3: FURTHER DETAILS FOR FIGURE 5 – EXAMPLES OF GLOBAL INNOVATION OFFICE INITIATIVES BY JURISDICTION

INNOVATION OFFICES

Jurisdiction	Operator	Name of Initiative
Australia	Australian Securities and Investment Commission (ASIC)	ASIC Innovation Hub
Austria	Finanzmarktaufsicht (FMA)	FMA FinTech Point of Contact and FMA FinTech Navigator
Bahrain	Central Bank of Bahrain	FinTech Unit
Belgium	National Bank of Belgium and Financial Services and Markets Authority	NBB Contact Point for FinTech and FSMA FinTech Contact Point
Canada	Ontario Securities Commission (OSC)	OSC LaunchPad
Cyprus	Cyprus Securities and Exchange Commission	CySEC Innovation Hub
Denmark	Danish Financial Supervisory Authority (Finanstilsynet)	FinTech Forum
Estonia	Estonian Financial Services Authority – Finantsinspektsioon (EFSA)	-
Finland	Fianssivalvonta	Innovation Helpdesk
France	Autorité des Marchés Financiers (AMF) Autorité de Contrôle Prudentiel et de Résolution (ACPR)	AMF FinTech, Innovation, and Competitivness division and ACPR FinTech-Innovation Unit
Germany	Bundesanstalt für Finanzdienstleistungsaufsicht (BaFIN)	BaFin FinTech
Hong Kong	Securities and Futures Commission of Hong Kong (SFC)	SFC FinTech Contact Point
Hong Kong	Hong Kong Monetary Authority (HKMA)	HKMA FinTech Facilitation Office
Hungary	Magyar Nemzeti Bank	MNB Innovation Hub
Iceland	Fjármálastöðugleiki	Innovation Hub
Indonesia	Otoritas Jasa Keuangan (OJK)	OJK Infinity
Ireland	Central Bank of Ireland	Innovation Hub
Italy	Banca d'Italia	Canale FinTech
Japan	Japan Financial Services Agency	FSA FinTech Support Desk
Japan	Bank of Japan	BoJ FinTech Center
Latvia	Financial and Capital Market Commission	Innovation Centre
Liechtenstein	Financial Market Authority	Regulierungslabor
Lithuania	Bank of Lithuania	-
Malaysia	Bank Negara Malaysia	Financial Technology Enabler Group
Netherlands	Autoriteit Financiële Markten (AFM) and De Nederlandsche Bank (DNB)	AFM and DNB Innovation Hub

Jurisdiction	Operator	Name of Initiative
Norway	Finanstilsynet	-
Poland	Komisja Nadzoru Finansowego	Innovation Hub Programme
Romania	Autoritatea de Supraveghire Financiara	InsureTech Innovation Hub
Singapore	Monetary Authority of Singapore (MAS)	MAS Financial Technology and Innovation Group
Spain	Comission Nacional del Mercado de Valores	FinTech/Innovation Portal
Sweden	Finansinspektionen	Finansinspektionen's Innovation Centre
Switzerland	Swiss Federal Council and Swiss Financial Markets Supervisory Authority (FINMA)	FINMA FinTech
Thailand	Securities and Exchange Commission	-
UK	Financial Conduct Authority (FCA)	FCA Innovate
USA	Office of the Comptroller of the Currency (OCC)	OCC Office of Innovation
USA	Commodities and Futures Trading Commission (CFTC)	LabCFTC
USA	Bureau of Consumer Financial Protection (BCFP)	BCFP Project Catalyst

REGULATOR/CENTRAL BANK LINKED ACCELERATORS

Jurisdiction	Operator	Name of Initiative
Abu Dhabi	Abu Dhabi Global Market (ADGM)	Plug and Play
Bahrain	Tamkeen	Flat6Labs
Dubai	Dubai International Financial Centre	FinTech Hive
France	Banque de France	Le Lab Banque de France
Hungary	Magyar Külkereskedelmi Bank	MKB FinTech Lab
Portugal	Startup Lisboa	Startup Lisboa
Singapore	Monetary Authority of Singapore (MAS)	Global FinTech Hackcelerator
South Korea	Seoul Metropolitan Government	Seoul FinTech Lab

ANNEX 4: FURTHER DETAILS FOR FIGURE 7 – EXAMPLES OF GLOBAL REGULATORY SANDBOX INITIATIVES BY JURISDICTION

OPERATIONAL SANDBOXES

Jurisdiction	Operator	Name of Initiative
Abu Dhabi	Abu Dhabi Global Market Financial Services Regulatory Authority	FinTech RegLab
Abu Dhabi	Abu Dhabi Global Market Financial Services Regulatory Authority	Regulatory Sandbox
Australia	Australian Securities and Investments Commission (ASIC) and Australian Prudential Regulation Authority	Regulatory Sandbox
Bahrain	Central Bank of Bahrain	Regulatory Sandbox
Brunei	Brunei Monetary Authority	Regulatory Sandbox
Canada	Canadian Securities Administrators (CSA)	Regulatory Sandbox
Denmark	Danish Financial Supervision Authority	FT Lab
Dubai	Dubai Financial Services Authority	Innovation Testing Licence
Hong Kong	Hong Kong Monetary Authority (HKMA) and Securities and Futures Commission of Hong Kong (SFC)	FinTech Supervisory Sandbox
Hong Kong	Insurance Authority	Insuretech Sandbox
Hungary	Magyar Nemzeti Bank	Regulatory Sandbox
India	State of Maharashtra	Regulatory Sandbox
Indonesia	Bank Indonesia	Regulatory Sandbox
Japan	Japan Financial Services Agency and Government	FinTech Proof of Concept Hub
Jordan	Central Bank of Jordan	FinTech Regulatory Sandbox
Kazakhstan	Astana Financial Services Authority	FinTech Regulatory Sandbox
Lithuania	Bank of Lithuania	LB Chain
Lithuania	Bank of Lithuania	Regulatory Sandbox
Malaysia	Bank Negra Malaysia (BNM)	Financial Technology Regulatory Sandbox
Mauritius	Economic Development Board	Regulatory Sandbox
Mozambique	Central Bank of Mozambique and Financial Sector Deepening Mozambique	Regulatory Sandbox
Netherlands	Autoriteit Financiële Markten (AFM) and De Nederlandsche Bank (DNB)	Regulatory Sandbox
Nigeria	Central Bank of Nigeria and Nigeria Inter-Bank Settlement System	Financial Industry Sandbox
Philippines	Bangko Sentral Ng Philipinas (BSP)	Regulatory Sandbox
Poland	Komisja Nadzoru Finansowego	Regulatory Sandbox
Russia	Central Bank of Russia	Regulatory Sandbox

Jurisdiction	Operator	Name of Initiative
Saudi Arabia	Saudi Arabian Monetary Authority and Saudi Arabia Capital Market Authority	Regulatory Sandbox
Sierra Leone	Bank of Sierra Leone	Regulatory Sandbox
Singapore	Monetary Authority of Singapore (MAS)	FinTech Regulatory Sandbox
Switzerland	Swiss Federal Council and Swiss Financial Markets Supervisory Authority (FINMA)	Regulatory Sandbox
Taiwan	Financial Supervisory Commission	Regulatory Sandbox
Thailand	Bank of Thailand (BoT)	Regulatory Sandbox
UK	Financial Conduct Authority	Regulatory Sandbox
USA	Arizona State Regulators	FinTech Sandbox
USA	Bureau of Consumer Financial Protection (BCFP)	No-Action Letters and (proposed) BCFP Product Sandbox

FORTHCOMING SANDBOXES

Jurisdiction	Operator	Name of Initiative
Bermuda	Bermuda Monetary Authority	Insurance Regulatory Sandbox
Brazil	Banco Central do Brazil	Laboratory of Financial and Technological Innovations
India	Reserve Bank of India	Regulatory Sandbox
India	Insurance Regulatory and Development Authority of India	Regulatory Sandbox
Indonesia	Otoritas Jasa Keuangan (OJK)	Regulatory Sandbox
Jamaica	Bank of Jamaica	Regulatory Sandbox
Kenya	Capital Markets Authority	FinTech Sandbox
Mexico	National Banking and Securities Commission, Ministry of Finance, and Bank of Mexico	Regulatory Sandbox
Norway	Norwegian Parliament and Norgess Bank	Regulatory Sandbox
Spain	Spanish FinTech and InsureTech Association	Regulatory Sandbox

PROPOSED SANDBOXES

Jurisdiction	Operator	Name of Initiative
China	China Banking Regulatory Commission	Regulatory Sandbox
EU	European Banking Authority and European Commission	Regulatory Sandbox
Fiji	Reserve Bank of Fiji	Regulatory Sandbox
Japan	Tokyo Metropolitan Government	Regulatory Sandbox
Malta	Malta Gaming Authority	Cryptocurrency Sandbox
South Korea	Financial Supervisory Service	Regulatory Sandbox
Sri Lanka	Central Bank of Sri Lanka	Regulatory Sandbox
Uganda	Operator(s) To Be Confirmed	Regulatory Sandbox

ANNEX 5: FURTHER DETAILS FOR FIGURE 11 – EXAMPLES OF GLOBAL REGTECH INITIATIVES BY JURISDICTION

Jurisdiction	Operator	Underpinning Technologies
Australia	Australian Securities and Investment Commission (ASIC)	AI, Machine Learning, Big Data, API, Cloud Computing
Australia	Australia Transaction Reports and Analysis Centre	Big Data, AI, Machine Learning, API
Austria	Oesterreichische Nationalbank	Big Data, AI, Machine Learning
Brunei	Autoriti Monetari Brunei Darussalam	Big Data
Europe	European Central Bank	Big Data, DLT
Hong Kong	Securities and Futures Commission of Hong Kong	Big Data
India	Unique Identification Authority of India (UIDAI)	Digital ID
Italy	Banca d'Italia (BoI)	Big Data, Machine Learning
Japan	Bank of Japan	Big Data, Machine Learning
Kenya	Kenya Capital Markets Authority	Big Data
Lithuania	Bank of Lithuania	Big Data
Mexico	Comisión Nacional Bancaria y de Valores (CNBV)	Cloud Computing, Big Data, AI, Machine Learning
Mexico	Comisión Nacional del Sistema de Ahorro para el Retiro	Big Data, Machine Learning, Digital ID
Netherlands	De Nederlandsche Bank (DNB)	Cloud Computing, Big Data, AI, Machine Learning
Nigeria	Central Bank of Nigeria	Big Data, API
Nigeria	Nigeria Inter-Bank Settlement System	API
Peru	Superintendencia de Banca y Seguros del Perú	AI
Philippines	Bangko Sentral NG Philipinas (BSP)	API, Big Data, AI
Russia	Bank of Russia	Big Data, Machine Learning
Rwanda	National Bank of Rwanda (BNR)	Big Data, API
Singapore	Monetary Authority of Singapore (MAS)	Cloud Computing, Big Data, AI, Machine Learning, API
Sweden	Sveriges Riksbank	Big Data
Thailand	Bank of Thailand (BoT)	DLT
UK	Financial Conduct Authority (FCA)	Cloud Computing, Big Data, AI, Machine Learning
UK	Bank of England (BoE)	Big Data, AI, Machine Learning
USA	Securities Exchange Commission (SEC)	Cloud Computing, Big Data, AI, Machine Learning
USA	Bureau of Consumer Financial Protection (BCFP)	Big Data, API
USA	Federal Reserve	Big Data
USA	Financial Industry Regulatory Authority (FINRA)	Machine Learning

ANNEX 6: INNOVATION OFFICE CASE STUDY – UK FINANCIAL CONDUCT AUTHORITY INNOVATE

One of the earliest regulators to create an innovation office was the Financial Conduct Authority, which launched Project Innovate in October 2014. Unlike many other regulators, the FCA has a statutory objective to promote effective competition in the interest of consumers. This mandate has driven the authority to promote financial services innovation (Woolard, 2018a).

Now known as Innovate, the office encompasses functions that seek to promote "innovation in the interests of consumers."

Innovate began as a start-up with a small team. Since 2014, it has grown into a large department with around 30 staff and numerous functions, including a regulatory sandbox and RegTech.

Its initial core function (entitled "Direct Support") was to help innovative firms understand and navigate the UK's regulatory framework. Access to specialist support includes help navigating the licensing process and guidance on how the UK regulatory framework may apply to different business models and forms of financial services.

Innovator firms seeking a license work closely with a case officer to ensure that a high-quality application is submitted. Case officers are the primary point of contact, providing constructive advice and engaging with other FCA technical experts as required.

The functions of Innovate

Innovate has built upon the core Direct Support function, and includes:

- A policy function that addresses unnecessary barriers to innovation while ensuring consumer protection and enhanced market integrity.
- An engagement function that promotes awareness of FCA support and engages with domestic and international regulators on lessons learned and good practices.
- A regulatory sandbox that enables small-scale, live tests of innovative products, services, and business models under FCA supervision.
- An "Advice Unit" that supports firms developing automated financial services models.
- A RegTech function that explores the use of technology to overcome regulatory challenges.

The impact of Innovate

The impact of Innovate has been substantial. The Direct Support function alone has supported over 500 firms, with a further 70 supported through the regulatory sandbox (Woolard, 2018b). The FCA observes that this has promoted choice, variety, and other positive outcomes for consumers in the financial services markets (Woolard, 2018a). One financial inclusion-focused firm that has benefited from Direct Support is Aire. The firm utilizes alternative credit-scoring methods like big data to build credit assessments for those who may be excluded (perhaps due to a lack of credit history). The FCA helped Aire quickly understand whether its service was a regulated activity (Woolard, 2015) and the firm was subsequently licensed in the UK (Finextra, 2016).

The FCA's regulatory sandbox has been cited as a positive means of encouraging inclusive financial innovation (UK Parliament, 2017). The FCA also concludes that access to the sandbox has reduced the time and cost of bringing innovative ideas to market while building consumer protection safeguards into new products and services (FCA, 2017a). Examples include tests of personal financial management tools, cross-border remittance providers, micro-savings products, and new insurance models (Cambridge Centre for Alternative Finance and the Academy of Internet Finance, Zhejiang University, 2018). One test empowered consumers with faster payments and receipts of social security benefits (FCA, 2017a) while another provided more consistent advice for consumers struggling with debt (FCA, 2017a).

The innovation office has also informed wider regulatory reform. Through engagement with stakeholders, the FCA has sought to assess whether technology-enabled innovations require changes to the existing regulatory framework. For example, the innovation office noticed that an increasing number of firms were using distributed ledger technology (DLT). Upon analysis, the FCA noted that it was open to DLT deployment, provided that operational risks are properly identified and mitigated (FCA, 2017d).

Lessons learned from Innovate

The FCA's early experience provides a number of lessons for innovation offices. The first is that regulators need an open approach to engagement with innovators built on a genuine desire to learn about emerging tech and business models. As Christopher Woolard, Executive Director of Strategy and Competition, has noted, "The key to success here is an early engagement model that results in a better understanding of risks and benefits from both our perspective and also the firms progressing through this regulatory process" (Woolard, 2016b).

The FCA strongly focuses on outcomes and what innovation delivers for end users, demonstrated by the eligibility criteria that determine which innovators have access to the Direct Support team. A key criterion is that the proposed innovation must benefit consumers; it may also include a financial inclusion component. As the FCA explains, "…what we're looking for is not FinTech for FinTech's sake. Rather, we are looking for products that serve a genuine consumer need, that offer a solution to an underserved corner of the market or a new approach to a thorny issue" (Woolard, 2018a).

The FCA has always asserted that innovation is not a license to circumvent regulation, and that consumer protection and other regulatory objectives remain paramount (Business Insider, 2016). The use of eligibility criteria has provided one way of filtering out innovation that may lead to adverse outcomes.

Another lesson from Innovate is that innovators do not necessarily know which type of support they need, as the services of an innovation office and a regulatory sandbox may appear to be similar. Many firms would first benefit from understanding the regulatory framework they must operate in before going on to test ideas. This underlines the merit of a dedicated external engagement program that informs innovators on the support available through various innovative regulatory initiatives.

Supporting innovators requires a broad range of expertise within Innovate and the wider organization. Coordination with other FCA functions and departments has also informed the authority's policymaking process.

Finally, the FCA works to promote international regulatory engagement on financial innovation. To date, it has signed cooperation agreements with Australia, Canada, China, Hong Kong, Japan, Korea, Singapore, and the U.S.[59] The cooperation agreements contain two main elements: (1) they promote information sharing on emerging trends in financial innovation between authorities, and (2) they facilitate referrals between innovation offices to reduce regulatory barriers to entry in overseas markets. Recently, this has evolved into multilateral regulatory engagement through the Global Financial Innovation Network (FCA, 2018c).

59 https://www.fca.org.uk/firms/innovate-and-innovation-hub/engagement

ANNEX 7: REGULATORY SANDBOX CASE STUDY – BANK OF SIERRA LEONE

Why was the initiative introduced?

In 2018, the BSL piloted a regulatory sandbox to foster local FinTech innovation and development of new products, services, and business models designed to improve financial inclusion.

How did the regulator know that a problem existed?

Following a decades-long civil war and a major Ebola crisis, this West African state remains one of the most financially excluded countries on the planet. Fewer than 20 percent of adults have a financial account—less than half the average for Sub-Saharan Africa (SSA) (World Bank, 2017b). Only 11 percent have a mobile money account, which is also approximately half the SSA average (World Bank, 2017b). Women are disproportionately excluded, with only 15 percent claiming account ownership (World Bank, 2017b). Access to financial services is a key development objective.

In 2016, Sierra Leone launched its NFIS for 2017-2020 (BSL, 2017). The consultation involved key financial regulators, representatives from commercial banks, microfinance institutions, and other development partners. The NFIS recommends that Sierra Leone "formulate financial policies and regulations (as well as supervisory approaches) that allow space for innovation and creativeness toward the attainment of financial inclusion while factoring financial safety, soundness and integrity" (BSL, 2017). The NFIS mandate has provided support for the regulatory sandbox and promotes inclusive financial innovation.

The FinTech Challenge is another activity that fostered collaboration between regulators, non-traditional market players, licensed financial institutions, and other partners. The goal was to pilot innovative products, services, or solutions in the country's fragile context. Winners were offered cash prizes, seed capital, and admission to the BSL sandbox.[60]

While it is too early to gauge the impact of BSL's regulatory sandbox, four firms have been accepted into its first testing cohort (BSL, 2018). Products and services to be tested include a mobile money service that helps farmers save for agricultural inputs and an application that promotes financial literacy (BSL, 2018).

Which primary regulators and government agencies are involved in the initiative? What are their roles?

The BSL sandbox is a single-regulator initiative. The Bank's Governor has championed the sandbox and provided high-level support since its inception. The sandbox operates through two related working groups: a dedicated sandbox team responsible for day-to-day administration and a Sandbox Committee that provides oversight and support.

A full-time sandbox team of three is responsible for internal process design, market outreach, cohort selection, supervision, and reporting. The team reports to the BSL Sandbox Committee, an inter-department working group comprised of senior representatives from various BSL units.

All operational decisions, including cohort selection, testing plan approval, and determinations to allow companies to operate outside of the sandbox are initially recommended by the sandbox team, reviewed by the Committee, and ultimately approved by the Governor or Deputy Governor. This structure has functioned well to date.

60 Development of the sandbox framework was coordinated in conjunction with the Sierra Leone FinTech Challenge in partnership with FSD Africa. It was funded by UK government aid and UNCDF's Mobile Money for the Poor (MM4P), with support from USAID and the Last Mile Trust Fund.

Early lessons learned

Sandbox implementation can be resource intensive. The sandbox team found the application and test design process to be more time-consuming than anticipated. Although each firm accepted to the sandbox demonstrated potential to advance financial inclusion in Sierra Leone, regulatory uncertainties were not always clearly articulated in the applications. The team has spent time with firms to refine the regulatory hypothesis to be evaluated, testing and reporting methodology, and key external partners.

Dedicated resources can support latent marketplace demand. The sandbox team quickly became a focal point for FinTech engagement within the BSL, conducting market outreach via in-person meetings and radio announcements, supervising the initial cohort of sandbox participants, and iterating the sandbox based on early experiences. Even in Sierra Leone's budding FinTech ecosystem, the team reports demand for the BSL's market engagement, which benefits from full-time, dedicated resources.

Intake models may evolve based on market conditions. Based on market feedback, the sandbox intake process is evolving to include a cohort-based process for start-ups and an "open admission" process for incumbents eager to gather regulatory input on inclusion-oriented products and services.

ANNEX 8: REGTECH CASE STUDY – BANGKO SENTRAL NG PILIPINAS

BSP, the central bank of the Philippines, is long recognized as a pioneering regulator with innovative ideas. Its early embrace of "test and learn" can be seen as a precursor to regulatory sandboxes. BSP has recently begun experimenting with RegTech solutions to improve supervision of payments and credit. This comes from a need for enhanced competencies and tools, and a belief that the same technologies that have led to dramatic advances in consumer finance can also be used to oversee providers of those products and services.

BSP was one of the first regulators to join R2A in 2016 and is using the partnership to test two RegTech ideas. The first is supervisory reporting. The central bank currently receives 144 Excel-based reports from regulated institutions; validation requires the resources of an entire office within BSP (di Castri et al., 2018b). In addition, due to data quality issues, there is significant time lag in identifying risks.

BSP is testing APIs to connect data systems between the reporting institutions and the central bank. The goal is to improve supervision and reduce costs for BSP and the industry. Other objectives are to:

- "Allow financial institutions to submit data digitally and automatically to the financial authority.
- Increase the volume, granularity, and frequency—and improve the quality—of data submitted to the central bank.
- Enable BSP staff to improve data validation and analysis, and generate customized reports for supervisory and policy development purposes."[61]

BSP believes that data collection can be more efficient, with data directly fed into customized dashboards for timely analysis. Reduced compliance costs are a positive result as well, with the number of reporting schemes moving from 29 to one (di Castri et al., 2018b).

Following successful prototype testing, BSP is developing competencies to support longer-term integration and on-boarding of additional financial institutions.

Key performance metrics demonstrate early evidence of benefits. Data point submissions have decreased from around 107,000 to approximately 50,000 (di Castri et al., 2018b). Compliance costs have been reduced via a single reporting package that is automatically submitted with no human intervention (di Castri et al., 2018b). Processing time has been reduced from over 30 minutes to just 10 seconds (di Castri et al., 2018b).

BSP is also in the early phases of experimenting with a consumer complaints chatbot. The bank currently receives tens of thousands of complaints annually; a team of fewer than 10 responds to each manually. In addition to being labor intensive, the system is limited to calls and emails. BSP believes that the chatbot can widen consumer access to the grievance redress system.

This technology has the potential to provide automatic responses to common enquiries, which frees up resources for more difficult cases. The BSP can also use collected data to learn more about consumer sentiment and trends, which can improve supervision. Using RegTech for this purpose can build consumer trust and ensure that new technologies are safe to use.

The BSP hopes that a chatbot will enable:

- "Financial consumers to file complaints through their mobile handsets via either a [messaging] app or SMS, thereby creating new channels for them to correspond with BSP.
- BSP to (a) address queries and complaints through the chatbot; (b) manage the structure and flow of automated conversations based on expertise and historical data; and (c) use data and insights gathered through the chatbot for oversight and policy development purposes.

61 https://www.r2accelerator.org/bsp/

- Reduce employee workload and response time by delegating mundane and routine tasks (e.g., directing non-BSP complaints to the right institution) to chatbots, saving human labour for more complex or nuanced tasks."[62]

Building on the success of these two RegTech ideas BSP has identified other areas of focus, including an internal R2A-style program. While still early in its RegTech journey, BSP notes several factors important to progress: executive sponsorship and championship, buy-in from technical offices, and the ability of staff to see how RegTech can benefit their work. The BSP's ability to engage new types of vendors has also been crucial.

When asked about advice for regulators considering RegTech, BSP noted that external support is critical to getting started. Regulators can also learn from the experience of others when designing their own programs. BSP also added that, overall, RegTech can help build consumer trust and ensure that new technologies are safe to use.

62 https://www.r2accelerator.org/bsp/

ANNEX 9: IMPLEMENTATION CONSIDERATIONS CASE STUDY – MONETARY AUTHORITY OF SINGAPORE

This case study illustrates the key features of the MAS's approach to FinTech, particularly in relation to the Implementation Considerations noted in Chapter 3.

Singapore's aim is to create a financial ecosystem that supports a digital economy and FinTech development. The country's financial regulator, the MAS, plays a significant role in this ambition. While the MAS does not state financial inclusion as an explicit objective, it is believed that financial inclusion will be a strong byproduct of a digitalized economy.[63]

The MAS is focused both on the regulatory environment and the infrastructure that a digitalized economy requires. Underpinning the theme of a digital economy are 10 key principles. These include having a trusted digital identity framework, a trusted digital data hub, public infrastructure for a digital economy, and policymaking that uses empirical data.

A second key feature of the MAS's approach is the careful sequencing and combination of the various innovative regulatory initiatives illustrated in this report, as per Implementation Consideration 4. The MAS's innovation office, FTIG, serves as a primary point of coordination within MAS, in the development of FinTech-related regulatory policies and mobilizing the use of technological innovations in the financial industry (Rajah and Tann, 2016). In support of the principles (and per Implementation Consideration 7), the FinTech Office, set up by MAS, comprising other government agencies such as the Economic Development Board and Enterprise Singapore, serves as a single point of contact for all FinTech matters (MAS, 2017b).

The MAS's regulatory sandbox is also linked to regulatory reform. By allowing entities to operate in an environment under conditions that may conflict with existing MAS regulations, the sandbox is designed to provide feedback on the utility and propriety of current policies.[64] This allows regulatory reforms to be developed as—and when—required (Implementation Consideration 1).

There is also a strong focus on moving quickly and flexibly, as per Implementation Consideration 5. By way of example, the regulatory sandbox was introduced in a timely fashion following consultation (Implementation Consideration 2) with the industry and other key stakeholders (MAS, 2016). A number of informal mechanisms also keep the MAS abreast of relevant issues and industry perspectives, such as the Singapore FinTech Festival (MAS, 2017c), the Global FinTech Hackcelerator, and the ASEAN Financial Innovation Network.

The MAS has strong senior management buy-in on its innovative regulatory initiatives, as per Implementation Consideration 3. The MAS's internal Technology and Innovation Steering Committee, chaired by the Managing Director Ravi Menon, meets on a monthly basis to review proposed FinTech-related initiatives, with the objective of ensuring broad-level soundness.[65] Senior management also undertakes internal technology literacy trainings to show active support of the MAS's technology innovation stance,[66] which informally conveys institutional buy-in as well.

Finally, the MAS adopts an activity-based regulatory approach (rather than an institution-based one) to ensure that the regulations applied are right-sized to the risks which the activity poses (Menon, 2017). An example of such proportionality (Implementation Consideration 9) is the Payment Services Bill, targeted at regulating electronic payment systems (MAS, 2017a). Under the Bill, regulations are put in place based on categories of activities such as domestic money transfer services, cross-border money transfer services, merchant acquisition services, electronic money issuance, virtual currency services, and money changing services. Financial services providers need only fulfil the regulatory requirements, and obtain the license, for the particular category of service they are providing (Sia Partners, 2018).

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63 Interview with Sopnendu Mohanty, Chief FinTech Officer, Monetary Authority of Singapore, August 2018.
64 Ibid.
65 Interview with officials from FTIG and Data Analytics Group, Monetary Authority of Singapore, October 2018.
66 Ibid.

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ANNEX 11: ABBREVIATIONS

ACPR	Autorité de Contrôle Prudentiel et de Résolution
ADGM	Abu Dhabi Global Market
AFI	Alliance for Financial Inclusion
AFIN	ASEAN Financial Innovation Network
AFM	De Autoriteit Financiële Markten
AI	Artificial Intelligence
AMF	Autorité des Marches Financiers
AML	Anti-Money Laundering
API	Application Programming Interface
APIX	Application Programming Interface (API) Exchange
APRA	Australian Prudential Regulatory Authority
ASEAN	Association of Southeast Asian Nations
ASIC	Australian Securities and Investment Commission
BCB	Banco Central do Brasil
BCBS	Basel Committee on Banking Supervision
BCEAO	La Banque Centrale des États de l'Afrique de l'Ouest
BCFP	Bureau of Consumer Financial Protection
BIS	Bank for International Settlements
BMGF	Bill & Melinda Gates Foundation
BNM	Bank Negara Malaysia
BNR	National Bank of Rwanda
BoE	Bank of England
BoL	Bank of Lithuania
BoT	Bank of Thailand
BSL	Bank of Sierra Leone
BSP	Bangko Sentral ng Pilipinas
BTCA	Better Than Cash Alliance
CBA	Commercial Bank of Africa
CBJ	Central Bank of Jordan
CBK	Central Bank of Kenya
CCAF	Cambridge Centre for Alternative Finance
CFI	Center for Financial Inclusion
CFT	Combating the Financing of Terrorism
CFTC	Commodity Futures Trading Commission
CGAP	Consultative Group to Assist the Poor
CNBV	Comisión Nacional Bancaria y de Valores
CSA	Canadian Securities Administrators
DFS	Digital Financial Services Observatory
DIFC	Dubai International Financial Centre

DLT	Distributed Ledger Technology
DNB	De Nederlandsche Bank
EFSA	Estonian Financial Services Authority – Finantsinspektsioon
eKYC	Electronic Know Your Customer
ETL	Electronic Transaction Law
EU	European Union
FCA	Financial Conduct Authority
FINRA	Financial Industry Regulatory Authority
FSB	Financial Stability Board
FSD	Financial Sector Deepening
FTEG	Financial Technology Enabler Group
FTIG	FinTech and Innovation Group
G20	Group of 20
G20 HLP	Group of 20 High-Level Principles
GAO	U.S. Government Accountability Office
GDP	Gross Domestic Product
GDS	Government Digital Service
GFIN	Global Financial Innovation Network
GSMA	Groupe Spéciale Mobile Association
HKMA	Hong Kong Monetary Authority
IDB	Inter-American Development Bank
IFC	International Finance Cooperation
IMF	International Monetary Fund
IoT	Internet of Things
KCB	Kenya Commercial Bank
KYC	Know Your Customer
MAS	Monetary Authority of Singapore
ML	Machine Learning
MM4P	Mobile Money for the Poor
MNO	Mobile Network Operator
MSMEs	Micro, Small, and Medium Enterprises
NFIS	National Financial Inclusion Strategy
NUS	National University of Singapore
OCC	Office of the Comptroller of the Currency
OJK	Otoritas Jasa Keuangan
OSC	Ontario Securities Commission
P2P	Peer-to-Peer
PMJDY	Pradhan Mantri Jan Dhan Yojana
PoC	Proof of Concept
QR Code	Quick Response Code

R2A	RegTech for Regulators Accelerator
RBI	Reserve Bank of India
RBSA	Reserve Bank of South Africa
ROSCA	Rotating Savings and Credit Association
SARB	South African Reserve Bank
SFC	Securities and Futures Commission of Hong Kong
SHCP	Secretaría de Hacienda y Crédito Público
SME	Small to Medium Enterprise
SMS	Short Message Service
SSF	Superintendencia del Sistema Financiero
UAE	United Arab Emirates
UCL	University College of London
UIDIA	Unique Identification Authority of India
UK	United Kingdom
UNCDF	United Nations Capital Development Fund
UNSGSA	United Nations Secretary General's Special Advocate for Inclusive Finance for Development
USA	United States of America
USAID	U.S. Agency for International Development
USDS	U.S. Digital Service