

Leveraging technology to support supervision: challenges and collaborative solutions

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Introductory remarks

Good afternoon to you all, and thank you for inviting me to your Financial Statements event series.

Let me start by saying that we are in extraordinary times. The coronavirus (Covid-19) pandemic is a tremendous shock for the global economy, and we have seen lockdowns and containment measures on an unprecedented global scale.

Central banks, supervisors and international financial institutions are seeking to mitigate the immediate impact on the real economy through extraordinary fiscal, monetary and macroprudential measures.¹

But perhaps the more immediate consequence of the pandemic that has affected governments, central banks, financial institutions and many businesses has been a change in the way we work.

What would have been face-to-face meetings, such as this one today, have almost all been replaced by virtual conferencing. We are experiencing first-hand global collaboration through technology and platforms.

The Covid-19 pandemic has also accelerated trends in digital innovation that were already under way. For example, current developments bring to the fore digital payments and underscore the importance of resilient and accessible central bank-operated payment infrastructures that need to withstand a large range of shocks, including pandemics and cyber attacks.² And expanded use of digital payments can, in turn, fuel a rise in digital lending as companies accumulate consumer data and enhance credit analytics.³

If there is a silver lining to this crisis, in just three months we have seen the power and potential of how technology can support and improve the way we work. This has reinforced that technology is indispensable in our globally connected world.

All of these developments make central bank public goods more important than ever, and central banks need to be at the cutting edge of technology to serve society.⁴

¹ See BIS, *Annual Economic Report 2020*, and the BIS Bulletins, www.bis.org/bisbulletins/index.htm.

² See R Auer, G Cornelli and J Frost, "Covid-19, cash, and the future of payments", *BIS Bulletin*, no 3, April 2020.

³ See U Eriksson von Almen, P Khera, S Ogawa and R Sahay, "Digital financial inclusion in the times of Covid-19", *IMF Blog*, 1 July 2020.

⁴ For a discussion of the role of central banks in the new world of payments, see BIS, *Annual Economic Report 2020*, Chapter III.

Over recent years, we have seen growing interest from financial institutions and the official sector in the use of technology to support new business models and to solve regulatory and compliance requirements more effectively and efficiently.

“Regtech” refers to the application of financial technology (fintech) for regulatory and compliance requirements and reporting by regulated financial institutions. “Suptech” is the term for any application of fintech for regulatory, supervisory and oversight purposes.⁵ In many ways, these are two sides of the same coin.

The benefits and opportunities of regtech and suptech for regulated entities and supervisory authorities to improve efficiency, reduce manual processes and make effective use of data are enormous.

As they are more widely adopted, these technologies can enhance diligence and vigilance in risk monitoring and management in real time, improving the resilience and stability of the broader financial system.⁶

And yet challenges remain. In today’s remarks, I would like to share with you what we see as the main challenges and how we can address these collectively to build solutions and avoid silos.

The BIS Innovation Hub has been established to spearhead central banks’ response to digital innovation. We are building a portfolio of projects in areas relevant to central bank activities across the three Innovation Hub Centres in Hong Kong SAR, Singapore and Switzerland.

The BIS decided last month to expand the Hub’s global footprint to include new centres in London, Stockholm (with a group of Nordic central banks), Toronto and Frankfurt/Paris (with the ECB/Eurosystem), to be established over the next two years, as well as a strategic partnership with the Federal Reserve. Regtech and suptech feature high on our agenda.

Digital innovation knows no borders, and it is therefore the Hub’s mission to foster international collaboration and build on the efforts of central banks that have made significant advances in digital innovation. Partnerships with other stakeholders, such as bank and market supervisors, is critical for this task.

Benefits of regtech and suptech

In discussing the benefits and challenges of regtech and suptech, let me start with an example that supervisors are quite familiar with as part of their day-to-day supervisory remit.

For most financial authorities, data management workflows for many years have been heavily manual. Data collection typically involves reports that are submitted either in paper form or via email, which imposes file size restrictions and introduces operational and security risks.⁷

Staff of financial authorities validate data manually (for example, “spot checks” or statically automated checks using macros), and extraction, transformation and loading of data to prepare for analysis are also done manually.

⁵ See Financial Stability Board, *The use of Suptech and Regtech by authorities and firms: Market developments and financial stability implications*, forthcoming, and J A Barefoot, “Digitizing financial regulation: regtech as a solution for regulatory inefficiency and ineffectiveness”, Harvard Kennedy School *M-RCBG Associate Working Paper Series*, no 150, June 2020.

⁶ See Financial Stability Board, *ibid.*

⁷ See S Di Castri, S Hohl, A Kulenkampff and J Prenio, “The suptech generations”, *FSI Insights*, no 19, October 2019.

Storage is fragmented across spreadsheets or desktop databases, data analysis is performed in relatively simplified spreadsheet models, and visualisations are contained in static reports that require manual updating. Because of data and infrastructure limitations, analytics tend to be descriptive in nature.

Of course, many authorities have also made significant progress in addressing some of these manual inefficiencies by automating certain paper-based and manual processes. Typically, this involves web-based portals or bulk uploads for the submission of regulatory returns.

Yet as noted by one industry player, automating existing processes is an improvement “but it isn’t transformational and, in areas where the existing processes are not fully effective, we are basically just failing faster”.⁸

Automation coupled with built-in automated validation checks, can also allow for more dynamic data visualisation in business and risk dashboards, while improved analytical processing facilitates deeper diagnostic analysis (for example, scorecards) as well as richer descriptive insights.

Now imagine a world where big data architecture is built with technology stacks that support data of higher granularity, diversity and frequency than could be accommodated previously.

Data loading and consolidation are fully automated using, for instance, application programming interfaces (APIs). Larger data pools, ample data storage and greater computing power enable continuous data interrogation and more advanced statistical modelling, including predictive analytics.⁹

With the addition of artificial intelligence (AI)-enabled solutions or tools, automation is taken one step further as natural language processing is leveraged to scrape data from the web or machine learning is used to match and merge disparate data sets, driving parts of data management and analysis to inform authorities’ actions.

This is not science fiction. This technology is available today.

If it is adopted, supervisory teams would have more time to spend on pre-emptive and early supervisory actions before any potential problems start to materialise.

Suptech applications can enhance supervisory capabilities and efforts to improve the existing supervisory and risk management toolkits. For financial institutions, the use of regtech can lead to potential cost reductions for regulatory processes including fraud detection, regulatory reporting, data collection and risk management.¹⁰

So why then have supervisors and financial institutions not more proactively adopted this new generation of technology?

Challenges for digital transformation

In recent surveys of authorities and global financial institutions, supervisors and executives agree that digital transformation is no longer just “nice to have”.

⁸ Hummingbird Regtech co-CEO Matthew Van Buskirk quoted in C Colgan, “Compliance in risk talent: technologies first?”, *ABA Risk and Compliance*, 13 August 2020.

⁹ See Basel Committee on Banking Supervision, *Report on open banking and application programming interfaces (APIs)*, November 2019.

¹⁰ See Financial Stability Board, *op cit*.

Various surveys show that there is progress, but there is still quite some way to go. A 2019 joint survey by the Cambridge Centre for Alternative Finance (CCAF) and the World Bank found that regulatory innovation initiatives are still relatively rare. Among the sample of 111 jurisdictions, only 38 had innovation initiatives such as innovation offices or regulatory sandboxes.¹¹

Regtech and supotech programmes were the least common regulatory innovation initiatives. Only 14% of the regulators surveyed had such a programme in operation, and a review of the key supotech technologies suggests that between 8% and 18% of jurisdictions surveyed employed each of them. Beyond the automation of existing processes, examples of supotech projects include real-time access to bank data, natural language processing of consumer complaints and fit and proper assessments for board members.¹²

In response to shifting market dynamics, many financial institutions are also turning to business transformation enabled by digital innovation.

The Institute for International Finance has told us that of 60 global banks surveyed in 2019, around one third are actively using machine learning techniques in credit models used for credit scoring and as input for regulatory capital calculations.¹³ Similarly, in 2018 one third of surveyed banks were applying machine learning techniques for anti-money laundering and combating the financing of terrorism (AML/CFT) compliance purposes, such as transaction monitoring, risk assessments and customer due diligence.¹⁴

Notwithstanding this important progress, there appear to be challenges that are common to both supervisors and banks alike and speak to the heart of technological innovation in the financial sector.

Let's start with the technology itself.

Post-Great Financial Crisis, the complexity and opacity of internal models enabled some banks to game the system, resulting in unsatisfactory levels of capital to reflect risks during the financial crisis. We also came to realise that both boards and their supervisors had little understanding of the risk parameters being used, contributing to an excessive degree of risk-weighted asset variation.¹⁵

The debates on the use of AI and machine learning and "black box" risk in decision-making therefore sound very familiar. In particular, it may be difficult for human users at financial institutions – and regulators – to grasp how outputs and decisions generated by AI and machine learning tools have been formulated and can be explained.

It may be no coincidence that banks are increasingly interested in using AI and machine learning tools to increase the efficiency, accuracy and speed of "capital optimisation".

As we now know post-crisis, the lack of transparency around these applications is problematic for institutions, their boards and supervisors if it is not possible to understand how undesired events occurred and when steps may need to be taken to prevent a recurrence.¹⁶

Current bank regulatory, supervisory and licensing frameworks generally predate the emergence of technology-enabled innovation. In some jurisdictions, prudential authorities do not have a remit for firms

¹¹ World Bank and CCAF, *Regulating alternative finance: results from a global regulator survey*, 2019.

¹² See ECB Banking Supervision, "Exploring the potential of supervisory technology", *Supervision Newsletter*, 12 August 2020.

¹³ Institute for International Finance, *Machine learning in credit risk report*, 2019.

¹⁴ Institute for International Finance, *Machine learning in anti-money laundering – summary report*, 2018.

¹⁵ See S Ingves, keynote speech at the Institute for Law and Finance conference on "Basel III: Are we done now?", Goethe University, Frankfurt am Main, 29 January 2018.

¹⁶ See Financial Stability Board, *Artificial intelligence and machine learning in financial services: Market developments and financial stability implications*, November 2017.

that are not banks, and some services previously conducted by banks are now being provided by other firms that may not be regulated by bank supervisors.

Such fintech-related changes may therefore require regulators and supervisors to leave their comfort zone and reassess their current supervisory models and resources in order to ensure continued effective oversight of the banking system. But as supervisors know, this requires concerted efforts by different agencies to approach this in tandem.

This is not only about breaking the silos of financial regulation. It is about creating a multidisciplinary dialogue with authorities regulating third-party providers (such as telecoms regulators), and with authorities confronted with comparable technological challenges. AI has the potential to challenge law enforcement in many areas. For example, financial regulators could learn a lot from the rich discussions on the use and abuse of predictive justice.¹⁷

However, other challenges are not entirely about technology.

The talent pool, resources and need for expertise are without a doubt major issues for both supervisors and banks. The demand for data scientists and engineers is higher than supply and continues to grow as both incumbents and firms build a digital infrastructure, from storage on the cloud to cyber resilience defences. And for supervisory authorities in particular, competing with the private sector and tech firms to attract them is sometimes not feasible – although authorities have good selling points to attract data scientists, such as the opportunity to work for the common good and the ability to access troves of unexploited data. To address this, fintech education, resource planning and training, and engaging with technology firms should be a focus. Shouldn't supervisors aim at meeting the very standards they set for the industry?¹⁸

Underlying the slow uptake may also be the fact that digital transformation requires a certain degree of uncertainty, experimentation, and a “fail fast” mindset.¹⁹ I think we can agree that these attributes do not always sit comfortably with prudent supervisors and risk-minded financial institutions. I see this clearly from my position at the BIS Innovation Hub, a laboratory nested in a respectable, 90-year old cooperative of central banks.

Many financial institutions report that collaboration and building an ecosystem of alliances and partnerships with fintechs is important to the success of digital transformation. Forming innovation partnerships can help the financial institutions to accelerate digital transformation by changing culture, mindset and technology, and it can shorten the development timeline of innovative projects by allowing the technological and regulatory processes to run in parallel rather than in a sequence.²⁰

However, banks have reported that onboarding fintech partners often presents a major challenge as it typically comes with a long lead time. And these new and innovative partnerships often introduce new sets of risks that may exceed supervisors' risk appetite. Lively discussions on the merits and risks of regulatory sandboxes illustrate this difficulty.

¹⁷ See eg European Commission for the Efficiency of Justice (CEPEJ), *European ethical charter on the use of artificial intelligence in judicial systems and their environment*, Council of Europe, February 2019.

¹⁸ Such as for senior management to “continuously review the skills, competencies and training requirements to ensure that it has the right set of skills as technologies and risks evolve” and to “regularly benchmark its cyber resilience capabilities against the market to identify its gaps in terms of governance, skills, resources and tools, treating these gaps as cyber risks and addressing them accordingly” (ECB, *Cyber resilience oversight expectations for financial market infrastructures*, December 2018, expectations no 30 and 45).

¹⁹ See Institute of International Finance and Deloitte, *Realizing the digital promise: Top nine challenges to digital transformation for financial institutions*, February 2020.

²⁰ Ibid

Trusted collaboration between regulatory authorities, financial institutions and external technology experts may, therefore, be necessary to foster effective regtech and supotech adoption and overcome these challenges.

Building trusted platforms of collaboration

Some jurisdictions have been at the forefront of putting in place initiatives to improve trusted interaction with innovative financial players that could facilitate innovative technologies and business models for financial services, for example innovation hubs, accelerators and regulatory sandboxes.

The BIS has partnered with one such jurisdiction.

In Singapore, the Monetary Authority of Singapore and the ASEAN Financial Innovation Network have developed the API Exchange (APIX): the world's first cross-border, open architecture API marketplace and sandbox platform in which participants can integrate and test solutions with each other via a cloud-based architecture. Through APIX, financial institutions and fintech firms can also discover one another on a curated global marketplace, design experiments collaboratively in the sandbox and deploy innovative solutions rapidly at a lower cost.

To showcase this technology and the platform approach to regtech/supotech innovation, the BIS Innovation Hub and the Saudi G20 Presidency are co-hosting the first global virtual TechSprint initiative.²¹ This is the first time a virtual "hackathon" of this global nature and scale is being held for regtech and supotech solution development.

Fintech firms have been invited to develop innovative technological solutions that are fit for purpose to address real-life challenges faced by supervisory authorities and are readily deployable in interested jurisdictions.

These challenges relate to areas such as dynamic information-sharing: can a technological solution be developed to facilitate real-time sharing of critical information among regulators and supervisors?

This is particularly relevant for our current efforts to respond to Covid-19, as the use of an application that sources both structured and unstructured data could provide us with market feeds on measures undertaken within and across jurisdictions in terms of the regulatory and supervisory responses on a near real-time basis.

Monitoring and surveillance is another area where technology can bolster the supervisory armoury.

Artificial intelligence and machine learning, data visualisation tools and other technologies could help financial institutions conduct better monitoring and report suspicious activities in a more timely and accurate manner for AML/CFT purposes. The supervisor of the future could then be armed with tools to monitor AML/CFT risks at the main fiat-to-crypto conversion gateways, as well as help cryptoasset service providers comply with AML/CFT regulations.

Finally, turning to the example shared with you earlier, upstream solutions and tools that would enable regulators to easily prepare and transmit machine-readable and machine-executable regulations to their regulated entities should result in greater regulatory compliance, lower regulatory costs and burdens, better data quality and consistency in regulatory reporting, and more timely surveillance by the regulatory authorities.

²¹ See www.bis.org/hub/g20_techsprint.htm.

With more than 250 registrants and 128 solutions received from teams in 45 jurisdictions, spread across all global regions and states of development, there is clearly a lot of interest. This event not only showcases that such global collaboration can take place in a cost-efficient, trusted and secure way, but also that there is an active marketplace where viable solutions can be offered.

Our aim is that events like the TechSprint can both help the supply side firms mature and gain direct feedback from regulators on their specific needs, and stimulate demand among regulators as they evolve and transform on their digital journey.

This is also an opportunity to build scale by jointly developing regtech and supotech solutions that can be deployed globally. This would enlarge the universe of high-quality solutions and spur critical innovations in areas that would better address our common regulatory “pain points” and challenges. Importantly, we would also avoid doing this in silos.

Where else are we building solutions to address our supervisory challenges? Let me give another example of an area where the BIS Innovation Hub can help.

Foreign exchange and other financial markets have undergone profound structural changes over the last decade. Technological advances increased the share of electronic and automated trading.²² Trading occurs at ever higher frequencies, taking place across multiple venues and involving new types of financial institutions.

These trends make tracking and monitoring fast-paced electronic markets more challenging for central banks. To address the rise in requirements, the Innovation Hub’s Swiss Centre is developing a prototype of a central bank-specific, real-time capable market monitoring tool.

The electronic market’s focus on speed leads to a rapid degrading of the value of data with time, so analysis needs to be available immediately as input to a near real-time decision-making process.

Data volume, velocity and variety created by fast-paced markets necessitate technology that masters the dynamic data streams and provides insights at the rate at which data arrives. The Innovation Hub monitoring tool’s event-driven *data stream processing* architecture addresses these points and delivers an innovative solution to central banks.

The cloud-based stream processing platform will process real-time financial data feeds and compute relevant liquidity and market risk measures. As output, the monitoring tool will provide central banks with overviews of market conditions via customised dashboards and real-time alerts.

The monitoring tool will initially focus on the foreign exchange (FX) spot market. Trading on FX spot markets is highly automated and electronified, and it is important to most central banks. Extension to additional instruments such as FX futures and/or markets, eg treasuries, is possible at a future stage of the project.

Closing remarks

In closing, today I have only provided a broad overview of the challenges that remain for supotech and regtech to be embraced more widely, as well as a glimpse into the future of where we could be if we collaborate and coordinate our efforts.

²² See Markets Committee, *Monitoring of fast-paced electronic markets*, September 2018.

There will be a post-Covid world that will require us all to adapt to new ways of working, to be better equipped to deal with “new normals” and to be agile as risks change. Technology will be front and centre as we move forward into this new world.

I therefore take this opportunity to encourage you to consider what impetus and changes are needed so that we can make that shift towards becoming the supervisors of the future.

As the BIS Innovation Hub expands, and our project pipeline develops, I look forward to new opportunities to collaborate with the regulatory community and help answer your problem statements.

Thank you.