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COMPUTATIONAL REGULATION & SUPERVISION:

Harmonising form and function for actionable intelligence

Roundtable summary from Japan FinTech Festival

CO-PUBLISHER:

UNIVERSITY OF CAMBRIDGE Judge Business School | Cambridge Centre for Alternative Finance
CAMBRIDGE SUPTECH LAB

REG. GENOME

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JAPAN FINTECH FESTIVAL™

"Regulation is the highly choreographed process of generating public engagement in the creation of rules. Supervision is the mostly secret process of managing the public and private responsibilities over the risks that the financial system generates."

Brookings 2021

"Do not regulate, what you cannot supervise."

Valenzuela and Young 1999

"Modernisation is a journey, not an event."

Cambridge SupTech Lab 2022

Content

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UNIVERSITY OF CAMBRIDGE
Judge Business School

Cambridge Centre for Alternative Finance

CAMBRIDGE SUPTECH LAB

The Cambridge SupTech Lab accelerates the digital transformation of financial supervision to nurture resilient, transparent, accountable, sustainable, and inclusive financial sectors.

The Lab catalyses the scalable integration of innovative technologies, data science and agile methodologies by supervisory authorities to address the enduring and emerging challenges of the rapidly changing financial landscape. Through the Lab, financial authorities have championed the adoption of advanced suptech solutions that tackle critical issues such as financial crime, fraud, exclusion, climate change enablers, consumer protection, and artificial intelligence biases.

The Cambridge SupTech Lab is an initiative of the Cambridge Centre for Alternative Finance (CCAF) at the Cambridge Judge Business School, leveraging foundational intellectual property and know-how from the RegTech for Regulators Accelerator (R2A).

For more information, visit cambridgesuptechlab.org

REG. GENOME

RegGenome is a leader in the field of computational regulation, changing how the world produces and consumes regulatory information. As a regulatory data provider, we process the world's regulation using AI to transform what is human-readable into machine-readable and machine-consumable data.

Our data is processed according to information structures developed and reviewed with regulatory experts and anchored to regulatory standards in conjunction with the University of Cambridge, Regulatory Genome Project.

For more information visit www.reg-genome.com

ELEVANDI

Elevandi is set up by the Monetary Authority of Singapore to foster an open dialogue between the public and private sectors to advance FinTech in the digital economy. Elevandi works closely with governments, founders, investors, and corporate leaders to drive collaboration, education, and new sources of value at industry and national levels. Elevandi's initiatives have convened over 350,000 people to drive the growth of FinTech through events, closed-door roundtables, investor programmes, educational initiatives, and research. Elevandi's flagship product is the Singapore FinTech Festival, which runs alongside other fast-rising platforms such as the Japan FinTech Festival, Point Zero Forum, Inclusive FinTech Forum, Elevandi Insights Forum, The Capital Meets Policy Dialogue, The Founders Peak and Green Shoots.

For more information, visit www.elevandi.io

Introduction: Harnessing financial technology to unlock a virtuous innovation cycle

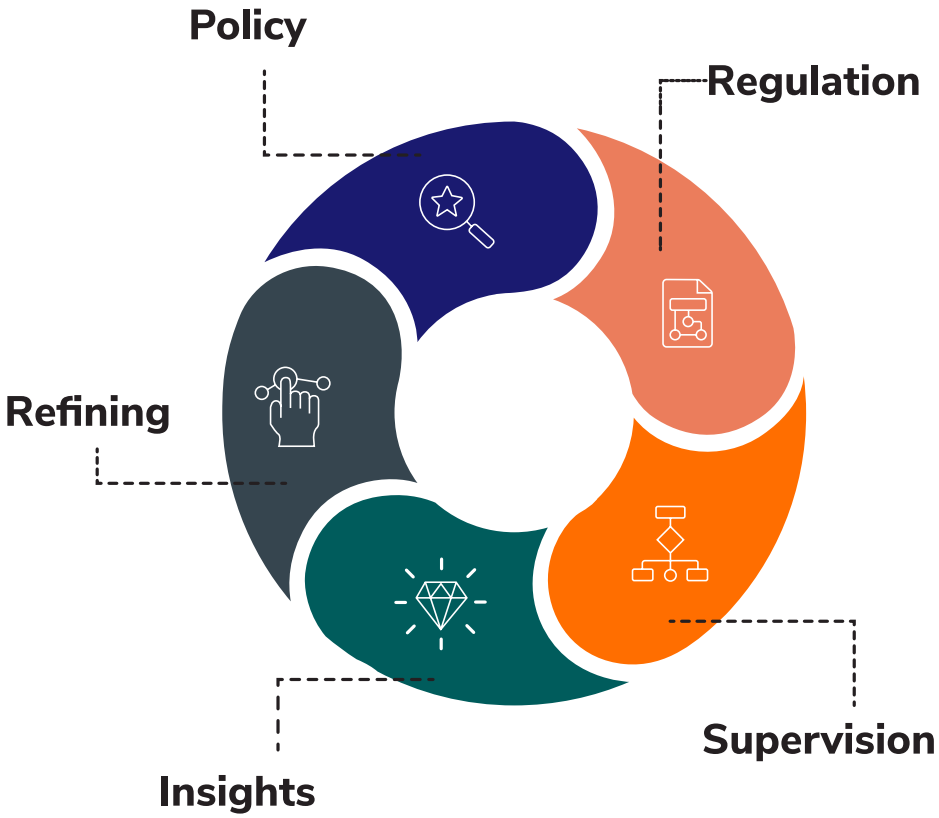
Fintech is here, bringing with it realised promises of market reach, innovation, and inclusivity. These advancements also come with novel and newly-magnified risks, such as opportunities for fraud and other misconduct. In principle, financial regulators and supervisors are tasked with identifying, monitoring, and mitigating the risks, in order to tip this balance in favour of the benefits.

In practice, however, we see divergent stories. Within the private sector, digitalisation is already changing the shape of the game for both commercial actors as well as fraudsters. On the public sector side, however, this transformation lags; despite earnest efforts to adapt to the digital deluge, the continued prevalence of manual activity and legacy systems and processes combine to create lag, ultimately exacerbating the aforementioned risks.

An observer of this space may see this monumental effort as Sisyphean, particularly in the face of an increasing gauntlet of legislative constraints, misaligned data protection rules, and new areas of compliance requirements. These well-intentioned rules and frameworks are currently seen as limitations that inexorably result in tension and inefficiency between the regulatory, supervisory, and industry parties. But this doesn't have to be the case.

Our roundtable conversations, summarised below, lay out an opposite thesis. Protecting the stability and security of financial systems can mitigate these competing priorities, but requires coordination across these various efforts, and in fact, can form a virtuous cycle. Policymakers set obligations regarding reporting, regulators implement the rules for industry to follow and report against, supervisors collect data and translate to actionable intelligence, which in turn serve a dual purpose of enforcing the regulation and assessing the impact of policy. The cycle then repeats by refining the policy and regulation, measuring via supervision, so on and so forth.

Figure 1: Illustration of a virtuous cycle that may be unlocked by meeting conditions including common data structures, digital data pipelines, and coordinated community and mindset.



Source: Cambridge SupTech Lab

Critically, several conditions are required to enable this coordination and unlocking of such a virtuous cycle, including three key areas discussed at the roundtable:

Condition 1: Common data structure. We must move from ad hoc data requirements set on an agency by agency (or jurisdiction by jurisdiction) basis, and instead work toward common data structures. Such shared blueprints/taxonomies can serve to unlock:

- Extraction of structure from unstructured data
- Development of infra enabling interoperable use of data
- Connection points for peers/vendors

Condition 2: Digital data pipelines. WWe must make a commitment to invest in a transition from human intensive processes to machine intensive tools. Tools to sufficiently process and analyse the volume and variety of data unlocks the ability to turn the insights generation engine on.

Condition 3: Coordinated community & mindset. We must move from siloed experiments, successes, and lessons learned toward engagement that is both intraorganisational (across departments) and global (across financial authorities). Exposure to these insights can serve to unlock:

- Sharing of proven successes & lessons
- Development of enabling ethics and procurement rules
- Building skillsets and technical capacity

So how do we get there? Two separate initiatives, emerging from research and expertise housed within the University of Cambridge, attempt to address these coordination problems: the Cambridge SupTech Lab (the Lab) and the Regulatory Genome Project. These different models have historically inhabited different spaces but have resulted in common experiences and conclusions. Yet, internally, as a result of technological and capacity advancements on both the regulatory and supervisory functions of financial authorities, we are now seeing opportunities to collaboratively overcome this coordination problem.

Key roundtable takeaways

How can technology empower financial authorities to move beyond spreadsheets and human-intensive processes? A pivotal roundtable with leading policymakers and think tanks explored the revolutionary potential of computational supervision, the future of financial oversight powered by AI and automation.

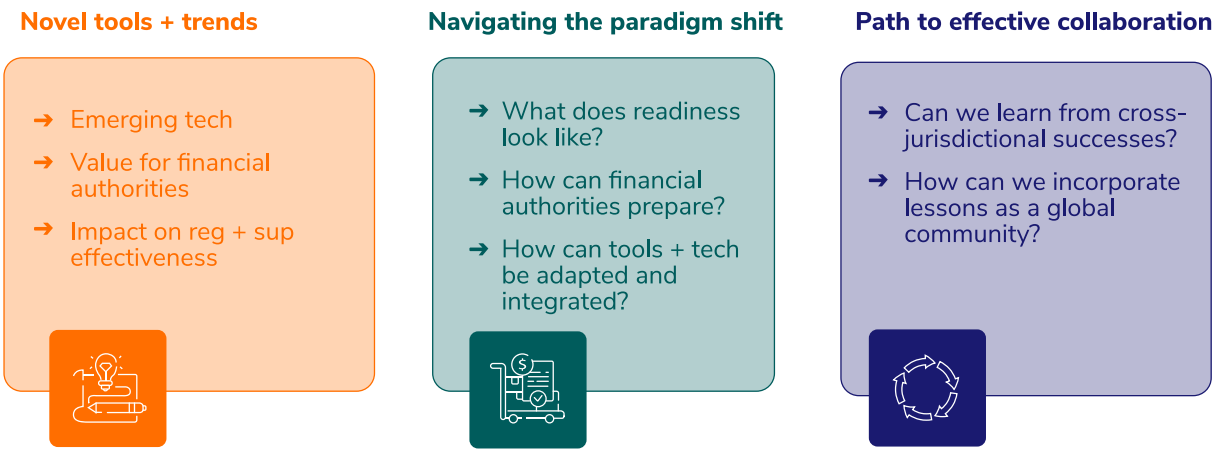
The Computational Regulation & Supervision: Harmonising Form and Function for Actionable Intelligence roundtable discussion at the 2024 Japan FinTech Festival (JFF) included seven leading policymakers, supervisors, and industry representatives from around the world, and was moderated by Professor Robert Wardrop, founder of the Regulatory Genome Project and the Cambridge SupTech Lab's Matt Grasser. Themes included how to move beyond human-intensive processes, creating coordination and cooperation that benefits both the public sector and the private sector, and how to transform data format and data processing to enable efficiency, clarity, and adaptability.

The roundtable aimed to advance industry thinking by bringing together regulators, supervisors, financial services, and technology leaders. Key outcomes that the roundtable aimed to achieve included:

1. Discuss tools and trends that hold the potential to end burdensome regulatory reporting as we know it, replaced by real-time data analysis and intelligent risk assessment.
2. Dive deep into the challenges and opportunities of this paradigm shift, from ethical considerations to industry readiness.
3. Better equip participants in this dialogue and observers to collaboratively navigate the frontiers of suptech and computational regulation, paving the way for a smarter, more agile, and efficient global financial system.

The following sections explore each of these themes in more depth, building on the roundtable conversations with resources and evidence from the broader ecosystem to present ingredients imperative to a healthy path forward.

Figure 2: Opportunities for collaboration and ingredients for how we might begin to harmonise form and function.



Source: Cambridge SupTech Lab

Theme 1. Novel tools and trends: from human-intensive to machine-intensive

"Regulatory information published today in a human-readable form is not fit for purpose in a digitally transforming economy."

JFF roundtable participant

Novel tools + trends

- Emerging tech
- Value for financial authorities
- Impact on reg + sup effectiveness

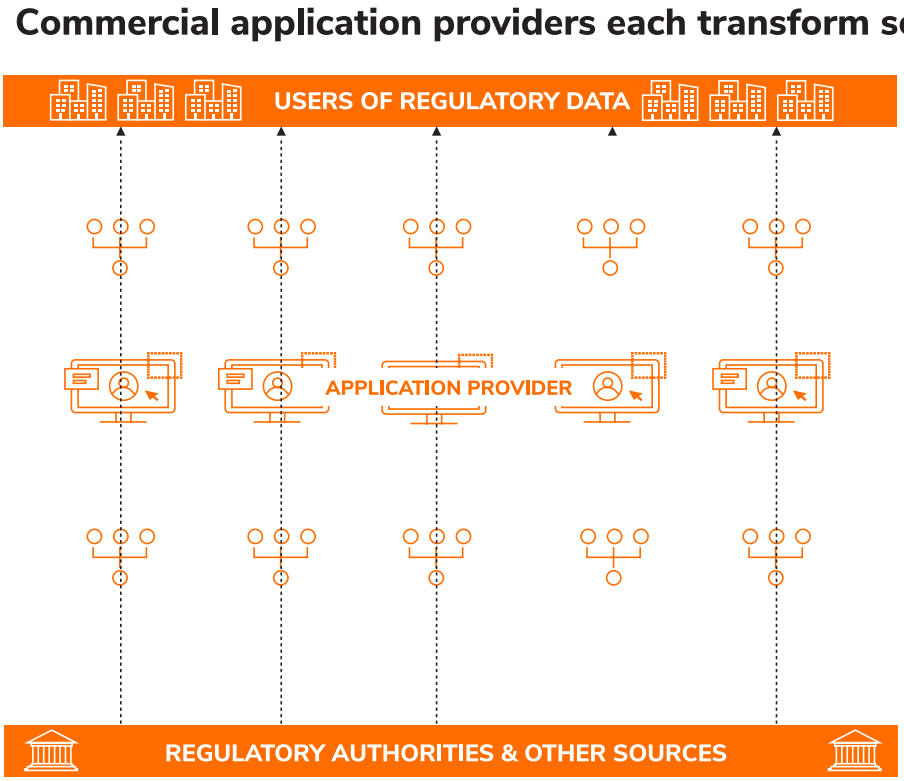
The ongoing digitalisation of the private sector is generating an abundance of data which is becoming a cornerstone of business operations. While organisations have the potential to thrive through advanced analytics and artificial intelligence. Digitalization also produces novel and newly-magnified risks for financial sector stability, equitability, and consumer safety.

Resulting paradigm shifts in financial regulation and supervision are paramount, given the potential for the world's financial systems to spiral out of control without adequate oversight. While financial crises have prompted the implementation of more checks and balances, the sheer volume and complexity of data pose a significant challenge for both regulated entities and the regulators and supervisors tasked with ensuring compliance and overall stability. Navigating this dynamic landscape requires agility in regulatory frameworks and an evidence-based, data-driven understanding of the evolving risks in the digital era.

Amidst these challenges, innovative tools and technologies offer transformative empowerment for the public sector through computational approaches. Computational regulation is emerging as a powerful tool for regulators, enabling them to efficiently process vast amounts of data and respond to emerging risks swiftly. Similarly, supervisors can leverage suptech, employing advanced technologies to enhance their supervisory processes and ensure a proactive stance in maintaining financial system stability. The convergence of private sector advancements and public sector empowerment through technology demands a collaborative effort among global experts to shape resilient regulatory frameworks for the future.

The prevailing format for issuing regulation is in a human-readable format (PDF), the contents of which which must be transformed into machine language to enable more efficient digital processes. Currently, the vast majority of processes involving even digital file formats (Excel, CSV) nearly always depend on manual validation, processing, and analysis. In addition, as some humans facilitate new formats of digital data, other humans work simultaneously to facilitate their own formats of digital data that only translate within their own system. As a result, human-created machine-readable data can't be used across systems, applications, institutions, organisations, countries, etc. because each machine-readable format is effectively its own language. It's the equivalent of a digital Tower of Babel - a lot of information but no cooperative understanding.

Figure 3: Illustration of the status quo for regulatory reporting, highlighting the inefficiencies produced by users of regulatory data (inclusive of private sector supervised entities) independently translating rules to produce disparate formats of regulatory reporting for the same reporting requirement across different regulatory authorities, producing both a challenge as well as opportunities for computational regulation and suptech.



Source: RegGenome

This is precisely where advances in computational regulation and supervision can play a crucial role.

Computational regulation

Computational regulation builds on machine-consumable regulation, which leverages advanced Natural Language Processing (NLP) tools to analyse, classify and process regulatory texts. By treating regulations as textual data, these tools can aggregate regulatory context, classify and tag regulations to unveil structural commonalities, and generate insights by drawing from historical examples. This approach not only streamlines the understanding of regulatory frameworks but also facilitates the identification of trends and areas for focused expert human review. As regulations become computational, the potential for seamless connection with supervisory technology (suptech) solutions is introduced, allowing for enhanced monitoring, compliance, and proactive regulatory interventions. Computational regulation in its fullest form has the following characteristics:

LOGICAL: Written as, or readily convertible to, a series of IF...THEN logical statements, which can trigger and inform the execution of an action or transaction by downstream software;
INTEGRATED: Incorporating look-up statements that query state-of-the-world data (via aliases, if necessary) to determine whether IF conditions are met;
UNAMBIGUOUS: Defines unambiguous logical statements and lookups by use of a known, consistent and precisely defined ontology of commands, operations, data sources, concepts and properties of concepts;
COMPUTABLE: Published in a format (eg XML or JSON) that can be processed by a machine using widely available software, where processed means accessed in such a way that the machine can read instructions as commands, identify relevant data given a connection to the matching data sources, and perform all logical tests set out in the instructions given relevant data.

Computational supervision, or “suptech”

LEVEL-SETTING

WHAT IS SUPTECH?

Portmanteau of “**supervisory technology**”

Application of tech and data science solutions to complement and enhance a public sector authority’s oversight capabilities
- e.g., tech for financial authorities overseeing financial markets

Technology-enabled journey
- Starts with digitisation of basic supervisory processes
- Advances toward the integration of sophisticated tools such as artificial intelligence, machine learning, big data analytics, and the like.

According to the Cambridge SupTech Lab's recent State of SupTech Report 2023, 81% of surveyed financial authorities indicate their involvement in various suptech initiatives, an increase from the 71% reported the prior year.

Adoption is currently focused on immediate quick wins via less advanced technologies such as descriptive analytics, dashboards, on-premises relational databases, web portals, and static reports. However, advanced technologies such as Generative AI are slowly entering the suptech scene as a form of late-generation suptech (7.6%). Such advanced technologies can not only help to most effectively navigate the seas of existing digital data to extract intelligence, but also to generate synthetic data for scenarios that have no precedent, such as implications of the current climate crisis.

Figure 4: Results from the Cambridge SupTech Lab's State of SupTech Report 2023, illustrating the evolution of suptech from existing efforts to date – focused on data collection and summarization – to a demand for tomorrow's tools that looks beyond the data, in favor of tools for coordinated, actionable insights surfaced through more advanced technologies.

Source: State of SupTech Report 2023

As a result of these advancements, more efficient information flows between consumers and supervisors is leading to marked improvements in areas like consumer protection and increased confidence in financial markets.

Cultural shifts are also beginning to happen in leadership, training, and interdisciplinary collaboration to ground suptech adoption in the context of broader digital transformation of the agencies. However, only a small percentage (9%) of organisations have formulated a comprehensive suptech strategy or roadmap, indicating a need for deeper coordination across departments and functions of the financial authority.

These combined advances in strategy, technology, and leadership are already beginning to unlock value, shifting the burden of data collection, validation, processing, storage, analysis, and intelligence extraction from human-intensive processes to machine-intensive risk management.

Theme 2. Navigating the paradigm shift: Meeting the challenges of transforming data and processes

> ***"Financial institutions need to figure out how they deploy their resources in a world where emerging risks ...become so complex that you no longer have the resources, the people to go through the manual processes."***
>
> ***JFF roundtable participant***

Navigating the paradigm shift

In preparing for the adaptation and adoption of such tools and approaches, public sector agencies must prepare to harmonise the integration of technology across their regulatory and supervisory functions. While standardisation and common practices can benefit many organisations and the people that use them, adopting these unified measures is not so simple. Even with clearly outlined benefits, challenges and roadblocks remain.

One barrier is a lack of universally acceptable standards that allows data to be shared across the financial ecosystem, but there is another layer. Requirements for regulators are constantly changing. Unforeseen dynamics such as climate data appear unexpectedly and don't behave statically. Banks and other financial institutions are reactively trying to satisfy requirements to regulations which are still dynamically active.

A second barrier is the higher bar that is placed on tech-enabled solutions than on the existing human-intensive processes being augmented. It is important for those navigating the tech adoption associated with digital transformation to compare against status quo—the multitude of systemic supervisory risks missed by human-intensive systems—rather than expecting absolute perfection from the technology out of the gate. While the potential for magnification of technological mishaps is obvious, keeping humans in the loop to monitor and iteratively adjust for such systemic issues, unintended consequences, and negative externalities can mitigate the vast majority of these risks.

While it's sensible to prioritise measures such as data standardisation and mindful tech adoption that benefit both banks and the public sector, there are still problems with incentive. The measures aren't as much of a benefit to the banks if they do not have roles solely dedicated to standardisation. The standards and accompanying processes would also have to be adopted in all areas, which will have its own challenges.

What are effective measures to counter these challenges? One proposed solution during the roundtable was to incentivise compliance by tying it to bonuses and additional tangible resources for banks and other financial institutions. Another proposal was to review standards and leverage available resources to help overcome existing challenges. Scrutinising current standards will clarify the scope of transactions needed to make data more functional within digital contexts and thus quantify necessary resources for standardisation. Leveraging existing resources of private sector tech-first companies may help regulators and financial institutions to adopt AI and other tools for digitisation and modernisation.

Finally, there exists an expressed need to remove knowledge barriers of available tools and technologies. Building outtechnological expertise in financial institutions will enable broader viewpoints and more paths to find the win-winopportunities for both public sector financial authorities and supervised financial institutions.

Theme 3. A path to effective collaboration: Creating "win-wins" via intelligent coordination

> *"You have to have a marriage between the business model of the private sector and then also what the public sector needs."*
>
> *JFF roundtable participant*

Path to effective collaboration

While navigation of the paradigm shift via integrated, tech-enabled tools are contingent on data availability, quality, and standardisation via agreed-upon standards, ensuring the coordinated and harmonised development of computational regulation and supervisory technologies also requires a thoughtful approach akin to constructing a regulatory nervous system.

The regulation serves as the mouth, articulating the rules and standards, while supervision acts as the eyes, ears, and nose, actively monitoring, detecting, and sniffing out potential risks and compliance issues.

However, the effectiveness of this regulatory nervous system hinges on the state of the "brain" orchestrating these functions. Currently, the regulatory "brain" is a network of international collaborations, standard-setting bodies, and regulatory agencies that need to enhance coordination, share best practices, and collectively define standards.

Establishing a cohesive regulatory intelligence, facilitated by global cooperation and information exchange, is essential to harness the full potential of computational regulation and supervisory technologies in promoting financial stability and resilience.

Introducing such innovation in the face of the dynamics of the current ecosystem, however, can be challenging. It is often the case, for instance, that the biggest private sector institutions purchase off-the-shelf, incumbent, enterprise regulatory compliance (regtech) tools. The authorities who receive reports from these systems then get comfortable with this integration and tend to embed idiosyncrasies into their processes. The supervised institutions naturally continue to use these same tools, even in the face of inefficiencies, to not upset status quo. To overcome this incredible inertia, alignment of incentives and clear returns on investment for all parties is critical.

For long-term success to be feasible with suptech tools and computational regulation, adopting them needs to be a win-win for both the public and private sector. Suptech proposals should be built around common challenges between the sectors so that each is invested in the solution. Conversations for solutions should happen directly between the public entities requiring protection and the private institutions being regulated. Mutually-beneficial systems should be created to communicate with each other immediately, enabling efficient transactions and vested processes to benefit everyone involved.

Success requires a deep understanding and communication of benefits among the parties involved. Direct experience, for instance via secondments of financial regulators and supervisors into industry or vice versa, is one model that has paid dividends among the participants. Models such as residencies and trainings can also serve to build a mutual understanding and empathy.

Next steps for computational regulation and supervision

The prevailing point brought up throughout the conversations was the importance of meeting the three conditions necessary to enable coordination and communication, and in turn to improve financial regulation and supervision as a whole:

- **Common data structures and standardised schemas** with elements of shared infrastructures and connections points.
- **Digital data pipelines** that use machine-intensive tools that are designed to account for both the intended and unintended consequences of their interactions and adoption into regulation.
- **A community mindset** that leverages coordination while eschewing individual silos in favor of shared resources that build skillsets and technical capacities to realise value in the public sector.

By levering these ingredients, we can convert the challenges introduced by fintech's paradigm shifts into opportunities for innovation, namely via computational regulation and suptech for supervision. While mindfully setting the stage for a virtuous cycle takes more initial investment than simply purchasing existing tools, we can also expect more lasting power, and truly harmonised form and function for financial regulation, among other outsized returns.

Further reading

- State of SupTech 2023: https://lab.ccaf.io/state-of-suptech-report-2023/
- State of SupTech 2022: https://lab.ccaf.io/state-of-suptech-report-2022/
- AI in Financial Supervision (3-part series): https://lab.ccaf.io/blog/artificial-intelligence-in-suptech-the-need-for-public-sector-adoption-and-adaptation/
- Cambridge SupTech Lab case studies: https://lab.ccaf.io/application-incubation/
- RegGenome whitepaper: https://reg-genome.com/enhance-llms-with-genai-regulatory-data/

Acknowledgements

Authors

Matt Grasser, Cambridge SupTech Lab
Matt is the Co-Founder and Co-Head of the Cambridge SupTech Lab, a multimillion, multiyear initiative to craft the digital future of financial supervision. He is a seasoned leader in expanding the frontier of the digital technology space, with over 15 years of broad-ranging, global experience to draw from. His driving passion throughout has been maximizing impact through effectively applied technologies, with an emphasis on meeting the needs of otherwise excluded or vulnerable people. This pursuit has led him into roles as a pioneering fintech entrepreneur, startup acceleration fund lead, hackathon & techsprint organizer, innovation gallery curator, academic lecturer, and strategic advisor for myriad financial innovation and digital transformation initiatives.

Professor Robert Wardrop, University of Cambridge & RegGenome
Bob is a member of the Finance faculty of the Cambridge Judge Business School at the University of Cambridge (CJBS) with expertise in regulatory innovation and the digitisation of the financial system. In 2021, he was awarded the CJBS Excellence in Teaching Prize for his teaching in the Master of Finance programme and in 2022 received the CJBS Sandra Dawson Research Impact Award. In 2015, Bob co-founded the Cambridge Centre for Alternative Finance, which during his tenure as its Founding Director has established itself as a global leader in researching channels and instruments of finance emerging in the digitisation of the financial system. Bob's current research focus is computational policy and regulation, which uses AI technology to enable regulatory information to be consumed in a machine-readable and machine-consumable form. Bob regularly advises national governmental and multi-lateral organisations on regulatory innovation and is currently a member of the Governor's Advisory Committee of the Bank of Mauritius and was a member of the International Technology Advisory Panel of the Monetary Authority of Singapore. He holds an MBA from Chicago Booth, and an MSc from the London School of Economics and a PhD from the University of Cambridge.

Speakers

Jessica Renier
Managing Director and Head of Finance,
Institute of International Finance (IIF)

Ryosuke Ushida
Chief FinTech Officer,
Financial Services Agency of Japan (JFSA)

Varlam Ebanoidze
Head of FinTech and SupTech Development &
Innovations Office, National Bank of Georgia

Nikos Andrikogiannopoulos
Founder and CEO, Metrika

Carey Hsu
Partner, Oliver Wyman

Ozzeir Khan
Director Digital for Development Operations
Division, Asian Development Bank (ADB)

Sigal Mandelker
Ribbit Capital, fmr. Under Secretary of Treasury
for Terrorism and Financial IntelligenceDivision,
Asian Development Bank (ADB)

Contributors

Adriana Senior
Head of Communications,
Cambridge SupTech Lab

Colin Milroy
Digital Marketing,
Cambridge SupTech Lab

Dayna Donovan
Graphic Design, Cambridge SupTech Lab

Contact the authors

Matt Grasser | m.grasser@jbs.cam.ac.uk
Professor Robert Wardrop | r.wardrop@jbs.cam.ac.uk