



## SUPERVISORY TECHNOLOGIES **SUPTECH**

How Suptech empowers regulators to supervise efficiently and effectively

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# EXECUTIVE SUMMARY

**Supervisory Technologies (SupTech) has become a key capability underpinning how Regulators supervise Financial Institutions owing in response to the emergence of Financial Technologies (Fintech).** SupTech entails the use of innovative technology by supervisory agencies to support supervision. SupTech is playing a big role in enabling Regulators to supervise and manage risks better. Some of the key SupTech segments for 2019 includes; (Risk management), Regulatory Reporting, Data Management, Financial Crime Surveillance and Identity Management. SupTech is being enabled by key technologies such as; cloud computing, machine learning (ML), predictive analytics, data transfer protocols and natural language processing (NLP).

**There are two main types of SupTech use case development;** (1) being investigative SupTech and (2) preventative SupTech. Investigative SupTech entails detection of regulatory non-compliance after its manifestation and main activities consist of Misconduct analysis, Data

Management and Reporting. Preventative SupTech on the other hand, implies allowing the supervisor to act in advance of a breach of regulation by any of the supervised entities, thereby monitoring the risk factors that could trigger a breach. Preventative SupTech activities entails Risk Monitoring, Financial Crime Surveillance and Identity Management.

**Locally our research indicated that SupTech development is still at a nascent stage with some room for growth.** The large proportion of the Regulators interviewed indicated that they are having plans and strategies in place to drive SupTech adoption, as well as to attract the skills needed.

There are key benefits such as enhance effectiveness, reduce costs, Improved consumer outcomes, and bringing of a larger share of the financial sector under supervision to be derived from the use of SupTech. However, there are also risks ranging from finding the right talent, funding or budgetary constraints, data quality issues, and operational risks.

To address some of the challenges the paper proposes a variety of best practices including; Hackathons, Internal innovation offices, and partnerships to attract innovators and fast-track SupTech efforts, around high impact use-cases. Ultimate success will depend on resources, digital ambition, partnerships, and operating model.





# INTRODUCTION

## What is SupTech

The increased scope and complexity of regulation has raised compliance costs for Financial Services Providers (FSPs) and presented a challenge for the supervisory authorities who must process and analyse data of ever-increasing volume, frequency, and granularity. Greater market diversity and innovation further stress the capacity of supervisory authorities in many jurisdictions. In response, supervisory authorities are seeking to leverage technology and digitise key processes in order to increase their efficiency and effectiveness<sup>1</sup>.

The use of innovative technology by supervisory agencies to support supervision is called SupTech<sup>2</sup>. SupTech initiatives are gaining momentum around the world. An increasing number of supervisory authorities are beginning to explore SupTech applications in different areas of supervision.

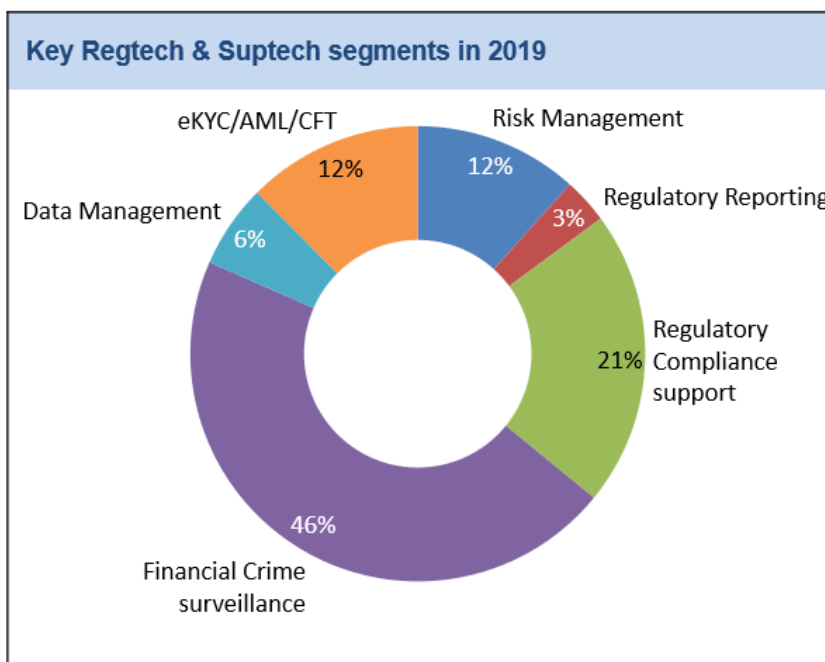
## Latest Key SupTech segments around the world

SupTechs are playing a big role in enabling Regulators to supervise effectively and efficiently. Key SupTech and segments include Financial Crime Surveillance, Data Management,

1 Available: <https://www.bis.org/fsi/publ/insights19.pdf>

2 Available: <https://www.bis.org/fsi/publ/insights19.pdf>

Exhibit 1: Key RegTech and SupTech Segments in 2019



Source: Deloitte Consulting 2019 RegTech Report Company

# INTRODUCTION

Regulatory Reporting, Risk Management, and Identity Management. Exhibit 1 indicates the leading key SupTech and RegTech segments in 2019.

Financial Crime Surveillance was the biggest segment in 2019. This is owing to growth in Artificial Intelligence (AI) for fraud detection due to vast amounts of data becoming digitised and computing power being stronger than ever. As a result market players are increasingly deploying AI technology solutions that can detect fraud at scale through detecting patterns in structured and unstructured datasets with a higher level of accuracy.

The second-largest segment for 2019 was Regulatory Compliance support. Growth in Regulatory Compliance support

- 3 Applications of innovative technologies that support compliance with regulatory and reporting requirements by regulated financial institutions

is being driven by a need for Cryptocurrency regulation, use of AI for fraud detection and identity verification. Cryptocurrency regulation is one of the key areas RegTech and SupTech is expected to impact. RegTech and SupTech enable analysis of digital crypto transactions, identification of suspicious activity, and sophisticated anti-money laundering monitoring.

Finally, Identity and Risk Management occupied the third spot as the third largest key segment in 2019. Identity verification and Risk Management as a fast-growing area is owing to Know Your Customer (KYC) laws requiring banks to verify identities and assess customer risk factors. RegTech enables automated processes to analyse high-risk individuals or entities and verify identities through comprehensive databases, ensuring higher accuracy and consistent recommendations.

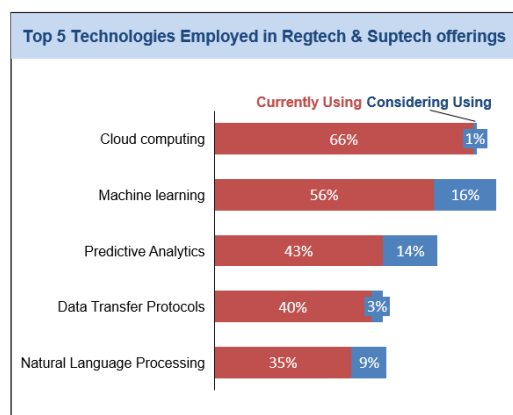
## Latest Key SupTech and RegTech enabling technologies around the world

The SupTech industry relies on a combination of key technologies to deliver its products and services. These include; Cloud computing, ML, Predictive Analytics, Data Transfer Protocols, NLP, Distributed Ledger Technology (DLT), Geographic Information System (GIS), voice recognition and others. Exhibit 2 provides the top 5 technologies employed in SupTech and RegTech and their industry share.

About two-thirds of 66% of the sector delivers its offerings through the cloud, with 56% of vendors employing ML and 43% using predictive data analytics to describe patterns or predict behaviours. Over a third of 35% NLP to parse regulatory content.

In proportion, the use of ML and data analytics is set to grow further and could be used by nearly three-quarters of vendors if current predictions are correct. Looking forward, however, it is voice recognition, DLT, and GIS mapping that are likely to make the biggest gains from current levels.

Exhibit 2: Top 5 Technologies Employed in RegTech and SupTech offerings



Source: Cambridge Centre for Alternative Finance Report 2019





## Various jurisdictions approach towards SupTech and RegTech

Globally, several jurisdictions are driving SupTech initiatives to support the supervisory work in their countries. Box 1 below provides a detailed account of various SupTech initiatives around the globe:

Box 1

### INITIATIVE 1



<sup>4</sup>NATIONAL BANK OF RWANDA (NBR)

The supervisory authority in Rwanda has developed a SupTech solution for automated data collection that can be leveraged for market conduct. The National Bank of Rwanda is currently running an automated data collection project, to enable supervisors to access raw data from supervised FSPs' systems and then process the data into reports using its own software.

The system comprises an electronic data warehouse to automate and streamline the reporting processes that inform and facilitate supervision. The data warehouse permits the National Bank of Rwanda to automatically "pull" data from the systems of supervised entities, reducing the need for manually produced reports and improving accuracy and consistency of data. The electronic data warehouse also facilitates daily automated data pulls for certain types of data.

### INITIATIVE 2



<sup>5</sup>Australian Security and Investment Commission (ASIC)

The Market Analysis and Intelligence (MAI) system of the Australian Securities and Investments Commission (ASIC), for example, allows for real-time monitoring of the Australian primary and secondary capital markets (ASX and Chi-X). The MAI system ingests real-time data feeds from equity derivatives products and transactions. The MAI system provides real-time alerts, identifying anomalies within markets that may be investigated or detected upon execution. These real-time alerts are integrated with daily operations and staff workflows.

Alerts trigger a workflow process that leads to further investigation and analysis to identify likely root causes. The results feed into a triage process that determines prioritisation and trigger in-depth investigations where appropriate.

4 Available: <https://openknowledge.worldbank.org/bitstream/handle/10986/29952/127577-REVISED-SupTech-Technology-Solutions-for-Market-Conduct-Supervision.pdf?sequence=4&isAllowed=y>

5 Available: <https://www.bis.org/fsi/publ/insights9.pdf>

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### INITIATIVE 3

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Monetary Authority Singapore (MAS)

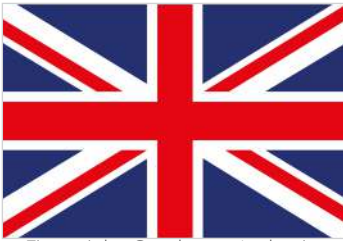
One SupTech innovation in the area of data analytics for detecting anti-money laundering (AML) violations can be found at the Monetary Authority of Singapore (MAS). MAS is creating a data analytics system to search through 3 000 monthly Suspicious Transaction Reports (STR) on money laundering and terrorist financing risks that financial institutions file with MAS. The STR Network Analysis solution will use NLP and ML technologies to analyse the reports. It will produce a suspicious money laundering sub-STR-network, which is a part of the overall STRnetwork generated by all STRs. Supervisors will use the detected suspicious money laundering sub-STR-network for further investigations.

The sub-STR-network includes information generated from the original STRs such as the entities in the STRs and the relationship between these entities. Based on this information, supervisors will be able to look for more data, such as transactions from the entities under suspicion. The technology will dramatically increase efficiency and effectiveness. Manually creating a network for identifying potential AML violations takes about two years. Using (AI)/ (ML) to do the same thing will require only a few minutes. Furthermore, AI/ML can pick up patterns in data that humans cannot.

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### INITIATIVE 4

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Financial Conduct Authority (FCA) and Bank of England

The Financial Conduct Authority and Bank of England have begun exploring the potential for machine-readable and executable regulations (MRERs), including through a TechSprint event hosted in November 2017. Creating an MRER means coding a regulatory requirement into language that can be read and executed by a machine. During the TechSprint event, participants successfully coded a small subset of reporting rules from the Financial Conduct Authority handbook into a language that machines can understand and execute by pulling the relevant information directly from the supervised entity. Participants also successfully simulated a rule change in the handbook in real-time.

The change was then automatically executed by the supervised entity. In addition to temporal and cost efficiencies, MRER offers the potential to remove some level of ambiguity from the interpretation of regulatory rules and generate automatic reporting based on those rules.

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6 Available: <https://www.bis.org/fsi/publ/insights9.pdf>

7 Available: <http://documents1.worldbank.org/curated/en/612021529953613035/pdf/127577-REVISED-SupTech-Technology-Solutions-for-Market-Conduct-Supervision.pdf>

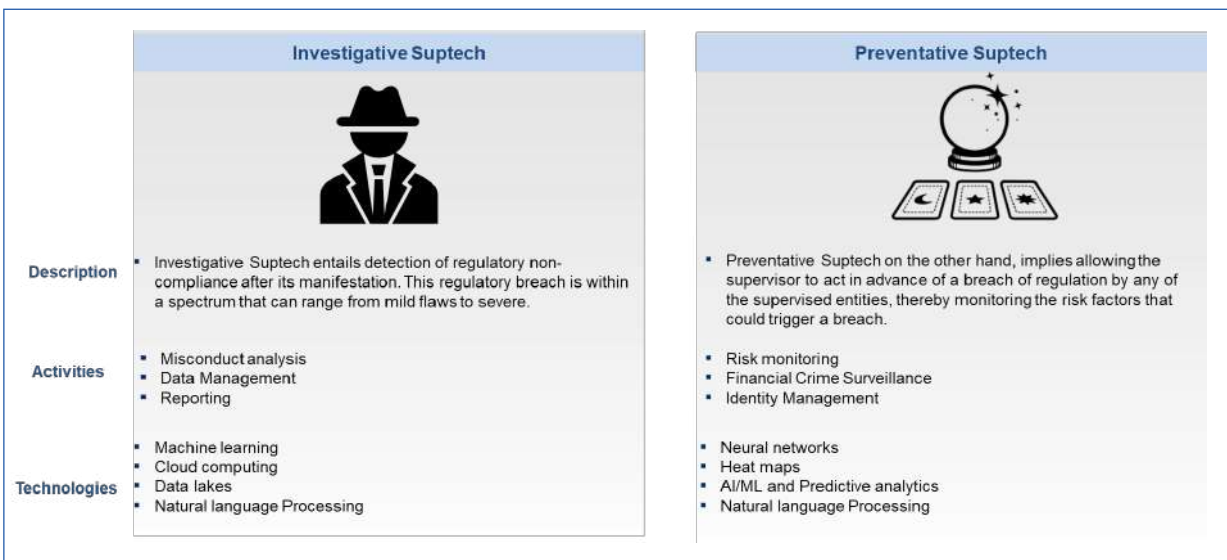




# SUPTECH USE CASE DEVELOPMENT

SupTech use case development can be found in two main areas of applications, Investigative SupTech and Preventative SupTech. Investigative SupTech entails the detection of regulatory non-compliance after its manifestation. This regulatory breach is within a spectrum that can range from mild to severe flaws. Investigative SupTech activities entails; Misconduct analysis, Data Management, and Reporting.

Exhibit 3: Two main types of SupTech use case development



SupTech technology enables Regulators to perform Investigative activities more efficiently and effectively. For example, under Data Management SupTech tools are being deployed to assist with data quality validation, analytics and allows for greater and more flexible storage of data. In Misconduct analysis, SupTech tools enable Regulators to analyse suspicious transactions, money laundering networks, terrorism financing, fraud, etc. while in Regulatory Reporting they enable the direct interface between the IT systems of the Regulators and FSPs.

Preventative SupTech on the other hand implies allowing the supervisor to act in advance of a breach of regulation by any of the supervised entities, thereby monitoring the risk factors that could trigger a breach. Activities under Preventative SupTech include Risk Monitoring, Financial Crime Surveillance, and Identity Management.

Similar to Investigative SupTech activities, Preventive SupTech activities also enable Regulators to supervise and manage risk more efficiently and effectively. For example, in Risk monitoring, SupTech tools can be used to detect liquidity risks, identify potential financial stability issues, macro-financial risks, etc. In Identity Management SupTech tools can be used to accurately process, verify, and authenticate identities, while in Financial Crime Surveillance the tools can be used to detect suspicious transactions, anti-money laundering transactions, terrorism financing, and fraud.

# SUPTECH CASE STUDIES

Supervisory agencies around the world are starting to explore both Investigative and Preventative SupTech solutions. Other agencies are even creating dedicated units to develop these solutions. This is being driven mainly by management decisions, research questions, and input from supervisory units<sup>8</sup>. Regulators are also maximizing their proximity to third parties service providers to their advantage, while some supervisory agencies have partnered with academic institutions or Non-Governmental Organisations to explore potential data analytics applications for supervision purposes<sup>9</sup>. Box 2 below outlined some of the examples of SupTech cased studies around the world.

## Box 2

### **<sup>10</sup>CASE STUDY 1: MEXICO AML DATA STORAGE AND ANALYTICS TOOLS**

The Comisión Nacional Bancaria y de Valores (CNBV), Mexico's national banking and securities commission, is charged with supervising its financial system. CNBV has reengineered its data infrastructure to strengthen its AML supervisory capacity and to accommodate a growing Fintech sector. The core of the new data infrastructure developed in collaboration with the RegTech for Regulators Accelerator (R2A) and Gestell, is a central access-controlled data storage platform that can house transactional data submitted by supervised entities via Application Programming Interfaces (APIs).



Once securely stored, the platform renders the data in risk dashboards, alerts, and statistical reports using ML models, advanced data analytics, and cutting-edge visualisation tools (e.g., algorithms and notifications). It identifies outliers (suspicious transactions, clients, or reports, including risk factors that are not visible to the human eye) and informs and targets on-site visits. Previously, the CNBV lacked an efficient means to extract insights from existing data since supervisors often had to upload appropriate data from compact discs and paper files and analyse them in Excel spreadsheets. The system reduces compliance costs. Enable CNBV to improve AML-related data validation and augment analytical capabilities using ML. Increase the volume, granularity, and frequency – and improve the quality – of AML related data. The new solution allows the CNBV to reduce inefficiencies and generate deeper intelligence, making AML supervision more risk-based.

8 Available: <https://www.bis.org/fsi/publ/insights19.pdf>

9 Available: <https://www.bis.org/fsi/publ/insights19.pdf>

10 Available: <https://bfaglobal.com/wp-content/uploads/2020/01/R2AWhitePaper.pdf>



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## "CASE STUDY 2: MICRO AND MACRO PRUDENTIAL SUPERVISION

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De Nederlandsche Bank (DNB) uses SupTech applications in identifying signals of emerging risks in the financial system using massive amounts of data from Financial Markets Infrastructures, such as payment systems. The researchers at the DNB convert the massive amount of transactions processed into risk indicators by applying traditional econometric methods to their data, developing algorithms to pick up relevant transaction types, developing indicators based on globally defined principles for financial market infrastructures and machine learning.



The United States Security and Exchange Commission use of NLP to measure market sentiment to assess the tonality of registrant filings. Together with topic modelling, the tonality signals are converted into risk measures using ML algorithms. The Federal Reserve, the European Central Bank and the Bank of England, for example, use “heat maps” to highlight potential financial stability issues. The Bank of England derive heat maps from automated analyses of daily and other data (such as stress tests) being produced by supervised entities.



These developments have led to reduction in compliance costs and improved off-site risk monitoring that allows for better and earlier detection of potential risks. They have also resulted into a more efficient information flows between providers and supervisors, consumers and supervisors, and across supervisors. Integration of structured and unstructured data, thus making analyses richer. Finally, they have enhanced supervisory capability by making possible the humanly impossible.

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11 Available: <https://www.bis.org/fsi/publ/insights19.pdf>



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## 12 CASE STUDY 3: AUTOMATED DATA COLLECTION IN AUSTRIA

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The Austrian central bank (OeNB), in collaboration with Austrian banks, has developed an innovative data-input regulatory reporting platform that provides a direct interface between the IT systems of the central bank and banks. The platform allows banks to upload data in a standardized format, according to Austrian central bank requirements and specifications. The central bank can then transform the data into smart cubes, or data sets, containing specific data and information relevant for different departments within the Austrian central bank.



Banks feed data into basic data-cube at Austrian Reporting Service (AuRep). This represents a single, complete description of the reporting data that is redundancy-free and contains harmonised definitions. Consecutively, a set of standardised transformation rules convert the data in the basic data-cube in such a way that it can be pushed to the OeNB. The model ensures more consistent and higher-quality data. It relieves banks from having to prepare different reports for different supervisory departments. Allows cost sharing of compliance between the supervisor and industry. Reduces Data Management and monitoring requirements and time in implementation of regulatory requirements.

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12 Available: <https://openknowledge.worldbank.org/bitstream/handle/10986/29952/127577-REVISED-SupTech-Technology-Solutions-for-Market-Conduct-Supervision.pdf?sequence=4&isAllowed=y>

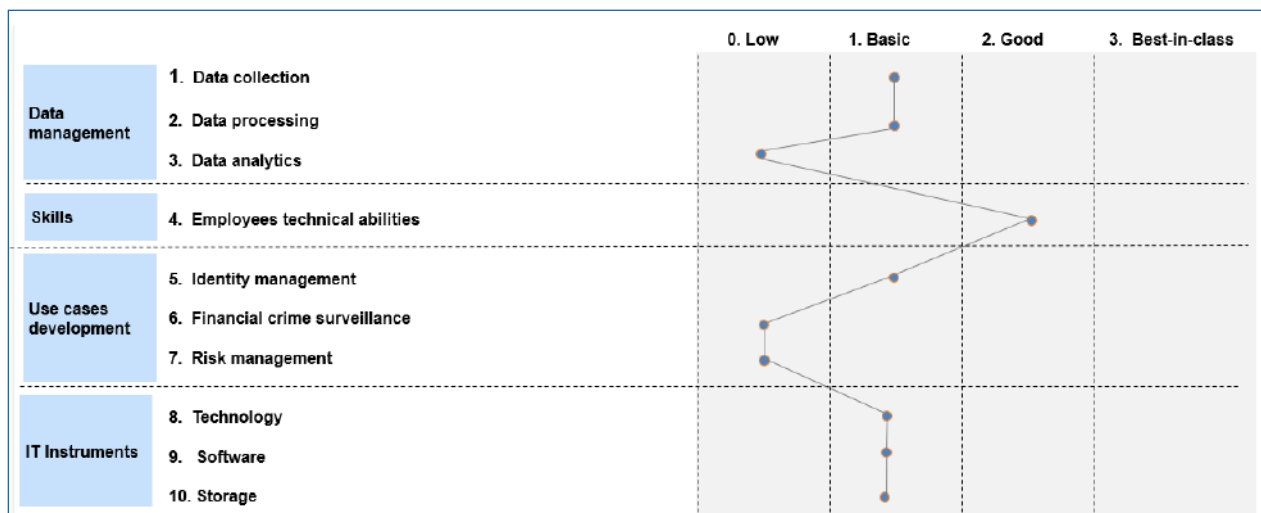
# INSIGHTS FROM SOUTH AFRICA FINTECH SURVEY

A survey was conducted in order to understand the level of SupTech maturity in South Africa (SA), various financial Regulators were interviewed. The survey focused on four main themes; Data Management, Skills, Use Case Development and IT instruments. Scales ratings from low, basic, good, and the best in class were used in the survey to benchmark the level at which South African financial Regulators are operating when compared with their counterparties considered to be the best across the globe.

Under Data Management, we were able to measure the level or extent to which South African financial Regulators are leveraging SupTech solutions to collect data, process data, and perform analytics. Regarding skills, IT and data science skills of South African financial Regulators employees were benchmarked with the skills of other organisations considered the best in the world.

Finally, we were able to measure the level at which SupTech tools are being deployed to support, Identity Management, Financial Crime Surveillance, and Risk Management; the extent to which IT instruments that enable SupTech are being adopted by South African financial regulators. Exhibit 3 highlight the survey findings followed by detailed discussion.

Exhibit 3: SupTech survey findings



# DATA MANAGEMENT

## DATA COLLECTION

A large proportion of Regulators surveyed indicated that they are using a combination of manual, bulk (web) uploads, and automated reporting to feed data into their systems. Almost all Regulators interviewed stated having plans/ strategies in place to enhance their data management processes. A very small proportion indicated having automated reporting and real-time monitoring capabilities on their data collection process. When benchmarked with the best in the world, the over-all scale was basic.

## DATA PROCESSING

A large proportion of Regulators have built-in data validation rules in their data processing systems, to process and validate the data. A small proportion of Regulators indicated having the ability to use SupTech enabling technologies such as robotics processing and (AI) tools e.g. (ML) to process their data, hence when South African financial regulators data processing capabilities compared with the best in the world fared basic. Meaning that there is still more room for growth.

## DATA ANALYTICS

Regarding analytics capabilities, a large proportion of Regulators are currently only able to conduct descriptive analytics (what happened?). Just a small proportion of Regulators have the ability to conduct both descriptive, diagnostics (why did it happen?), predictive (what will happen?), and prescriptive (what shall I do about it?) analytics. Data analytics capabilities of South African financial regulators is very low when benchmarked with the best in the world. More work still needs to be done to accelerate the growth in this regard.

# SKILLS

When compared with the best in the world, South African financial regulators employees' IT skills rated good. A large proportion of Regulators are having teams of IT specialists who have knowledge and skills in SupTech enabling technologies. There are also plans/ strategies by almost all the Regulators interviewed to move towards expanding their teams and build more data science skill sets. However, it is also important to note that there is a very small proportion of Regulators who have made many advances in terms of building data science capabilities. The Regulators have teams of employees who can do coding in various platforms and command AI knowledge and skills.



# USE CASE DEVELOPMENT

## IDENTITY MANAGEMENT

Regarding identity management, a large proportion of the Regulators are using the combination of in-house technological tools and a prominent technological tool such as GoAML to conduct KYC procedures, AML, as well as sanctioning and fraud screening. The use of SupTech enabling technologies such as AI is still on a very limited scale with only a small proportion of Regulators indicated that they are using it to support Identity Management function. In this regard, the use of SupTech tools to support Identity Management by South African regulators is still very basic, when compared with the best in the world.

## RISK MONITORING

A large proportion of financial Regulators are using simple descriptive statistics techniques to monitor risk with just a small proportion of financial Regulators currently deploying SupTech enabling technologies such as AI and its subsets e.g. ML to conduct risk monitoring. When compared with the best in the world, the use of SupTech tools to conduct risk monitoring is at a very low level in SA.

## FINANCIAL CRIME SURVEILLANCE

In order to conduct Financial Crime Surveillance, large proportion of organisations surveyed indicated having in-house built software tools that assist them to investigate AML/CFT, fraud, and other financial crimes. Just like other use cases, a small proportion of Regulators interviewed are deploying SupTech enabling technologies such as ML algorithm and NLP tools to support Financial Crime Surveillance.

# IT INSTRUMENTS

## TECHNOLOGY

A large proportion of Regulators interviewed indicated that they are in transition from digitalisation and automation of certain manual processes to data stack architecture supporting Big data technology and AI. Strategies/plans are already in place to advance the process.

## STORAGE DEVICES

Almost all the regulators interviewed indicate that they are storing their data in-house and on alternative physical sites. There is a desire to move to cloud storage services, but they are sounding cautious pointing at issues of the sovereignty of the state.

## SOFTWARE

A large proportion of Regulators surveyed are using software tools e.g. (SAS), Oracle, Power BI, Magic, Excel, etc. for data manipulation and there are plans to adopt AI tools in the future.

# OVERALL FINDINGS FROM THE STUDY

From the study, we managed to deduce that there are key benefits to be derived from the use of Suptech and key challenges in rolling out of Suptech in the financial sector. There are four distinct approaches used by Regulators across the world to rapidly scale their SupTech capabilities.

Innovative technologies have created a scope to strengthen financial supervision. Supervisory agencies around the world recognise this and are now either using or exploring a wide variety of innovative technologies to support their work. However, supervisory agencies also need to appreciate the risks and limitations of SupTech. Use of SupTech without taking the necessary measures to address technical, data quality, legal, operational, reputational, resource, internal support, and practical issues may expose supervisors to undue risks. Table 1 provides us with a detailed list of benefits and key challenges from the use of SupTech in the financial sector.

Table 1: Key benefits and challenges

KEY BENEFITS	KEY CHALLENGES
<ul style="list-style-type: none"><li>• SupTech applications enhance effectiveness by improving on traditional or manual processes, thereby allowing for faster supervisory action.</li><li>• SupTech applications reduce costs by automating processes that typically used to involve several people.</li><li>• SupTech applications enhance supervisory capability by making possible the humanly impossible. Securities markets supervisors, for example, receive thousands of regulatory filings from supervised entities. It is impossible for supervisors to review each one closely.</li><li>• SupTech leads to Improved consumer outcomes (better protection, increased confidence in market).</li><li>• SupTech tools brings in larger share of financial sector under supervision.</li><li>• SupTech enables and enhances risk-based supervision (better identification and measurement of risk).</li></ul>	<ul style="list-style-type: none"><li>• Supervisory agencies working with SupTech encountered data quality issues. Data quality and completeness can be an issue for non-traditional sources of information (e.g. social media).</li><li>• Finding the right talent is a key challenge and key person risk is high when it comes to SupTech.</li><li>• Lack of funding or budgetary constraints to be able to deliver the SupTech tools.</li><li>• Technical issues relate to computational capacity constraints and lack of transparency on how some technologies work.</li><li>• There is a heightened operational risk that comes with SupTech tools adoption, e.g. cyber-risk, which highlight the need for improved risk management in supervisory agencies when using SupTech applications.</li><li>• Supervisory agencies need to adhere to the standard rules and policies applicable in their jurisdictions when undertaking SupTech projects.</li></ul>





Regulators across the globe have adopted different SupTech approaches/models. The developing nations Regulators seemed to have opted for a partnership model, while their counterparts in the developed world are adopting the Innovation Offices' approach, Hackathons, and Tech Sprints as well as Digital Transformation. The contrast in the approaches is informed by the fact that a number of key technologies that can support SupTech, such as Big Data, AI, ML or, even Blockchain have remained largely out of reach in developing and low-income countries, either due to high costs or lack of computing power. Box 3 below lists findings regarding SupTech approaches around the globe.

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### INNOVATION OFFICES

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A dedicated hub or unit focused on researching trends and best practices and collaborating with emerging innovators.

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### HACKATHONS AND TECH SPRINTS

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A hackathon is a design sprint-like event; in which computer programmers and others collaborate intensively on problems identified by Regulators.

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### PARTNERSHIPS

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SupTech partnerships involve collaboration between a regulator and an industry service provider in rolling out an industry wide SupTech (or RegTech) solutions.

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### DIGITAL TRANSFORMATION

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Digital transformation is the integration of digital technology into all areas of a regulator, fundamentally changing how they operate and deliver value to stakeholders.

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# RECOMMENDATIONS

To address some of the challenges it is proposed that the IFWG adopt a variety of best practices including: Hackathons, Internal Innovation Offices, and Partnerships to attract innovators and fast-track SupTech efforts, around high impact use-cases.

SupTech areas of interest will entail, Real time monitoring, Market surveillance, Misconduct analysis (AML/CFT, Fraud), Forecasting and predictive analytics, Risk signaling (credit, liquidity) and Virtual assistance. Digital transformation and capabilities will focus on AI/ NLP/ Block chain/ DLT/RPA/ Intelligent automation (IA) and Collaboration technologies.

The successful execution will depend on the following specific enablers as highlighted in exhibit 4 below:

Exhibit 4: Four key enablers RegTech, SupTech and Digital Hackcelerator



# CONCLUSION

Evidence from both domestic and international markets indicates that Innovative technologies, together with increased data availability, create scope to strengthen financial supervision. Supervisory agencies around the world are recognising this and are now either using or exploring a wide variety of innovative technologies to support their work.

However, when compared with their counterparts across the globe, South African financial Regulators are still lagging on matters of SupTech adoption and digital transformation. In this regard, with the proposed recommendations, we believe it will be possible to accelerate SupTech adoption and digital transformation in the South African market.





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