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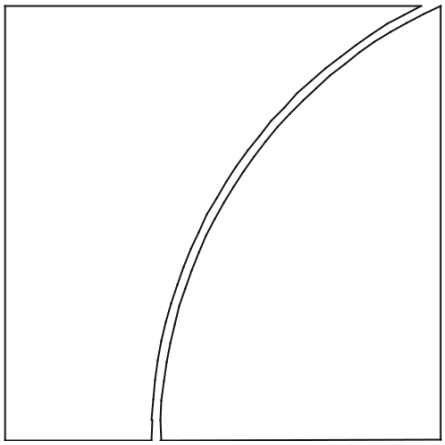

The suptech generations
超技术世代

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Suptech initiatives have gained momentum but it remains unclear exactly what falls within its scope. The term is defined by Broeders and Prenio (2018) as the use of innovative technology by supervisory agencies to support supervision. Since that publication, an increasing number of supervisory authorities are beginning to explore suptech applications in different areas of supervision. In addition, other non-supervisory financial authorities (eg financial intelligence units) have also used or experimented with innovative technologies to support their work. However, the Broeders and Prenio definition only refers to "innovative technology" without defining it. Consequently, the differing stages of technological progress across financial authorities have led to differences in the way "suptech" has been interpreted.

Suptech 的创新已经获得了动力，但是仍然不清楚到底什么属于它的范围。Broeders 和 Prenio(2018)将这一术语定义为监督机构使用创新技术支持监督。自该报告发表以来，越来越多的监管机构开始探索在不同监管领域的支持技术应用。此外，其他非监管性金融机构(如金融情报单位)也使用或试验创新技术以支持其工作。然而，Broeders 和 Prenio 的定义仅仅提到了"创新技术"，而没有对其进行定义。因此，各金融机构技术进步的不同阶段导致了对"suptech"的不同解释。

This paper examines these developments by analysing suptech initiatives in 39 financial authorities globally. Most of these financial authorities responded to a survey on suptech strategies and use cases conducted jointly by the BIS's Financial Stability Institute (FSI) and the Regtech for Regulators Accelerator (R2A).[2] The survey responses were supplemented by information from the two previous FSI Insights papers on suptech,[3] as well as by information from the online tracker developed by R2A.[4]

本文通过分析全球 39 个金融当局的超高科技措施，考察了这些发展。这些金融当局大部分回应了国际清算银行的金融稳定研究所(FSI)和 RegtechforregulatorialAccelerator(R2A)联合进行的有关超技术战略和用例的调查。2 调查回应的资料来自前两份有关超技术的 FSIInsights 论文，3 以及 R2A.4 开发的在线跟踪程序

Suptech is more broadly defined as the use of innovative technology by financial authorities to support their work. For the purposes of this paper, the term "innovative technology" refers

Suptech 的定义更广泛，是指金融当局利用创新科技支持其工作。就本文而言，"创新技术"一词是指

to the application of big data or artificial intelligence (AI) to tools used by financial authorities. This new definition clarifies the scope in terms of suptech users (ie including non-supervisory financial authorities such as financial intelligence units)[5] as well as the types of technology used (big data or AI).

大数据或人工智能(AI)应用于金融当局使用的工具。这一新定义明确了超高科技用户(即包括非监管性金融当局，如金融情报机构)5 的范围，以及所使用的技术类型(大数据或人工智能)。

Not all initiatives examined for this paper meet the above definition of suptech and could be considered more appropriately as belonging to different "generations" of technology. The first

并非本文所审查的所有倡议都符合上述关于供应技术的定义，可以更恰当地认为它们属于不同的"世代"技术。第一个

generation involves data management workflows with intensive manual input, and mostly delivering descriptive analytics. The second generation digitises and automates certain manual processes in the data pipeline. The third generation covers big data architecture whereas the fourth generation involves the addition of AI as the defining characteristic. Suptech straddles the third and fourth generations. In particular, third-generation data collection solutions and fourth-generation data analytics solutions are considered suptech for the purposes of this paper.

生成涉及数据管理工作流程，包括密集的手工输入，并且大多数情况下提供描述性分析。第二代数字化和自动化的某些手动过程中的数据管道。第三代包括大数据体系结构，而第四代包括增加人工智能作为定义特征。苏普特克跨越了第三代和第四代。特别是，第三代数据收集解决方案和第四代数据分析解决方案被认为是本文的支持技术。

1 This paper was authored by experts/members of the Financial Stability Institute of the Bank for International Settlements in collaboration with members/experts of the BFA's RegTech for Regulators Accelerator (R2A). Stefan Hohl (stefan.hohl@bis.org) and Jermy Prenio (jermy.prenio@bis.org), Bank for International Settlements; Simone di Castri (sdicastri@bfaglobal.com) and Arend Kulenkampff (akulenkampff@bfaglobal.com), BFA's RegTech for Regulators Accelerator (R2A).

本文由国际清算银行金融稳定研究所的专家/成员与 BFA 的 RegTechforregulatorAccelerator(R2A)的成员/专家合作撰写。斯蒂芬·霍尔(StefanHohl)(Stefan.Hohl@bis.org)、杰米·普雷尼奥(JermyPrenio)(Jermy.Prenio@bis.org)、西蒙娜·迪卡斯特里(SimonediCastri)(sdicastri@bfaglobal.com)和阿伦德·库伦坎普夫(ArendKulenkampff@bfaglobal.com)，BFA 的 RegTechforregulator(R2A)。

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2 Regtech for Regulators Accelerator is a non-profit, donor-funded accelerator programme administered by BFA Global that aims to help financial authorities in emerging markets and developing economies explore specific suptech solutions by providing support in building prototypes.

RegtechforregulatorialAccelerator 是一个由 BFAGlobal 管理的非营利性捐助者资助的加速器方案，旨在通过支持原型制造，帮助新兴市场和发展中经济体的金融当局探索具体的供应技术解决方案。

3 Broeders and Prenio (2018) and Coelho et al (2019).

BroedersandPrenio(2018)和 Coelhoetal(2019)。

4 See http://vendors.r2accelerator.org/?v=tracker.

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5 However, the paper does not include authorities in charge of monetary or macroeconomic policies that may also be using similar tools. See eg Tissot et al (2015).

然而，该文件并未包括负责货币或宏观经济政策的当局，这些当局可能也在使用类似的工具。参见 Tissotetal(2015)。

While suptech will help authorities to become more data-driven, the technologies that authorities use should be appropriate to the size, complexity and development of the sectors they oversee. For example, investments in big data architecture and AI tools might not be appropriate for an authority in a low-income jurisdiction that supervises only a handful of financial institutions providing basic financial products and services. Moreover, authorities should also be aware of the issues and challenges associated with suptech. Broeders and Prenio (2018) outlined some of these issues and challenges. In particular, the lack of transparency in some of the suptech data analytics solutions is a critical issue. This underscores the continued need for human intervention in the form of supervisory expertise to further investigate the results of analyses and when deciding on a course of action.

尽管 suptech 将帮助当局更多地以数据为导向，但当局使用的技术应该与其监管部门的规模、复杂性和发展相适应。例如，对大数据结构和人工智能工具的投资可能不适合低收入管辖区的主管部门，因为它们只监督少数几家提供基本金融产品和服务的金融机构。此外，当局也应该意识到与供应链技术有关的问题和挑战。BroedersandPrenio(2018)概述了其中一些问题和挑战。特别是，一些超高科技数据分析解决方案缺乏透明度是一个关键问题。这突出表明，仍然需要以监督专门知识的形式进行人员干预，以进一步调查分析结果和决定行动方针。

Almost half of the financial authorities covered have explicit suptech strategies or are in the process of developing them. The approaches taken vary. Some specify suptech roadmaps with a deliberate path towards adopting big data and AI processes and systems. Others have developed suptech applications as part of an institution -wide digital transformation and data-driven innovation programme. This is broadly aimed at moving the whole institution to more automated and digitised processes as well as adopting advanced data collection and data analytics tools. A well defined strategy can help authorities optimise the potential benefits of suptech for their organisation. But for authorities who want to explore specific suptech tools first before committing substantial resources, there are helpful institutionalised or one-off methodologies such as innovation labs, accelerators or tech sprints. These methodologies may also be embedded into authorities' existing or future suptech strategies.

几乎一半的金融机构有明确的支持策略，或者正在制定这些策略。所采取的方法各不相同。一些人指定了高科技的路线图，为采用大数据和人工智能进程和系统指明了一条深思熟虑的道路。还有一些国家开发了高科技应用，作为全机构数字转型和数据驱动创新方案的一部分。这主要是为了使整个机构更加自动化和数字化，并采用先进的数据收集和数据分析工具。一个明确的策略可以帮助当局优化 suptech 对其组织的潜在好处。但对于那些想在投入大量资源之前首先探索特定的超高科技工具的权威机构而言，有一些有用的制度化或一次性方法，如创新实验室、加速器或技术冲刺。这些方法也可能被嵌入到当局现有或未来的支持策略中。

The suptech use cases observed cluster mainly around misconduct analysis, reporting and data management. Conduct supervision and the work of financial intelligence units look at huge amounts of unstructured data. As such, they can particularly benefit from the development of big data architecture and AI tools. Virtual assistance, microprudential, macroprudential, and market surveillance make up a smaller share of the sample set.

支持技术用例主要围绕不当行为分析、报告和数据管理进行聚类。进行监督和金融情报单位的工作，查看大量的非结构化数据。因此，他们尤其可以从大数据架构和人工智能工具的发展中受益。虚拟援助、微观审慎、宏观审慎和市场监督在样本集中所占的份额较小。

Suptech solutions have emerged only recently, are mostly experimental in nature and are being developed within financial authorities. The majority of suptech initiatives reported are still in either the experimental or development stages, with less than a third operational. Most of the suptech initiatives covered in the paper are being developed internally or jointly with external developers or other organisations such as universities. Suptech initiatives developed solely by external vendors account for only a quarter of all reported initiatives. This could be due to the experimental nature of these initiatives, among other reasons. Consequently, many initiatives may lack clearly defined functional requirements or technical specifications with which to engage external parties. This suggests the importance of strategic partnerships between financial authorities, other governmental agencies, and academia as well as research organisations to help overcome the challenges associated with the experimental nature of these initiatives.

Suptech 解决方案是最近才出现的，大部分是实验性的，正在金融当局内部开发。据报道，大多数超高科技项目仍处于试验或开发阶段，只有不到三分之一的项目在运行。论文中提到的大多数超技术项目都是在内部或者与外部开发者或者其他组织如大学联合开发的。仅由外部供应商开发的 Suptech 倡议仅占所有报告倡议的四分之一。这可能是由于这些倡议的实验性质，以及其他原因。因此，许多倡议可能缺乏明确界定的功能要求或技术规格，以与外部各方进行接触。这显示金融当局、其他政府机构、学术界及研究机构之间建立策略性伙伴关系的重要性，有助克服这些措施的试验性质所带来的挑战。

Further international coordination and collaboration may help to accelerate suptech development. Global standard-setting bodies and international organisations provide platforms for

进一步的国际协调与合作可能有助于促进高新技术的发展。国际标准制定机构和国际组织为

authorities to exchange information on their suptech initiatives. These international platforms could also be used potentially to collaborate on the development of suptech solutions that may be useful to a number of authorities or to address related cross-border issues affecting the development of suptech (eg data localisation). A good example is the BIS Innovation Hub that aims to foster international collaboration on innovative financial technology within the central banking community. Such platforms will help authorities to benefit from peer learning, including from the experience of different types of authority (central banks, prudential regulators, conduct regulators etc), especially given the dearth of specialist providers. They should also reduce the need for individual authorities to independently work on similar solutions, thus increasing efficiency. In addition, given the inherently small market for suptech solutions, which limits business opportunities for private providers, accelerators set up or funded by international organisations could play an important role in helping authorities explore specific suptech tools.

当局交换他们的超高科技计划的信息。这些国际平台还有可能被用于合作开发可能对一些当局有用的超高科技解决方案，或用于解决影响超高科技发展的相关跨境问题(例如数据本地化)。国际结算银行创新中心就是一个很好的例子，该中心旨在促进中央银行界在创新金融技术方面的国际合作。这些平台将有助于有关当局从同行学习中获益，包括从不同类型的机构(央行、审慎监管机构、行为监管机构等)的经验中获益，尤其是在缺乏专业提供商的情况下。它们还应当减少各主管部门独立研究类似解决方案的需要，从而提高效率。此外，由于辅助技术解决方案本身的市场规模较小，限制了私营供应商的商业机会，国际组织设立或资助的加速器可以在帮助当局探索具体的辅助技术工具方面发挥重要作用。

2 超技术世代

Section 1 – Introduction
第一部分-简介

1. **Broeders and Prenio (2018) defined supervisory technology (suptech) as the use of innovative technology by supervisory agencies to support supervision**. The paper outlined the suptech applications used by some supervisory authorities, and mapped these applications onto the different areas of supervision. It also examined the practical experience of "early movers" who recognised the potential of suptech to turn risk and compliance monitoring from a backward-looking into a predictive and proactive process.
BroedersandPrenio(2018)将监督技术(suptech)定义为监督机构使用创新技术来支持监督。本文概述了一些监管部门使用的支持技术应用，并将这些应用映射到监管的不同领域。报告还审查了"先行者"的实际经验，他们认识到 suptech 的潜力，可以将风险和合规监测从回顾性的过程转变为预测性和主动性的过程。

2. **Since then, suptech initiatives have gained momentum around the world.** An increasing number of supervisory authorities are beginning to explore suptech applications in different areas of supervision. In addition, other non-supervisory financial authorities (eg financial intelligence units) have also used or experimented with innovative technologies to support their work. There now seems to be wider recognition of the potential of suptech to transform data processes in financial authorities, which would in turn enable better and more timely decisions and actions.
从那时起，超高科技项目在世界范围内获得了动力。越来越多的监管机构开始探索在不同监管领域的应用。此外，其他非监管性金融机构(如金融情报单位)也使用或试验创新技术以支持其工作。现在，人们似乎更广泛地认识到，suptech 有可能改变金融当局的数据处理，从而能够作出更好、更及时的决定和采取行动。

3. **However, it remains unclear as to what falls under the umbrella of "suptech".** The above definition only refers to "innovative technology" without defining it. Consequently, the differing levels of technological progress within financial authorities have led to differences in the way "suptech" has been interpreted.
然而，目前尚不清楚什么属于"供应链技术"的范畴。上述定义只提及「创新科技」，并没有界定「创新科技」。因此，金融当局内部技术进步水平的不同导致了对"超高科技"的解释方式的不同。

4. **To examine these developments, this paper looks at suptech initiatives in 39 financial authorities from 31 jurisdictions.** Graph 1 shows the financial authorities covered in this paper. Most responded to a survey on suptech strategies and use cases conducted jointly by the FSI and the R2A[6] during the second quarter of 2019. The survey responses were supplemented by information from the two previous FSI Insights papers on suptech,[7] as well as by information from the online tracker developed by R2A.[8]
为了检验这些发展，本文考察了来自 31 个地区的 39 个金融当局的超高科技措施。图 1 显示了本文所涉及的金融当局。2019 年第二季度，大多数回应了由财政统计局和 R2A6 联合进行的关于供应技术战略和用例的调查。调查的答复补充了来自前两篇 FSI 洞察力关于 suptech 的论文的信息，7 以及 R2A.8 开发的在线跟踪器的信息

Graph 1
图 1

Country	Authority
Australia	APRA, ASIC, AUSTRAC
Austria	OeNB
Brazil	BCB
Brunei	AMBD
Canada	FINTRAC
Czech Republic	CNB
Denmark	DFSA
EU	EIOPA
Germany	BBk
Greece	BoG
Guernsey	GFSC
Hong Kong	HKMA
Italy	BoI
Jordan	CBJ
Kenya	CBK
Lithuania	BoL
Malaysia	BNM
Mexico	BoM, CNBV, CONSAR
Netherlands	DNB

[7]

[8]

Regtech for Regulators Accelerator is a non-profit, donor-funded accelerator programme administered by BFA Global that aims to help financial authorities in emerging markets and developing economies explore specific suptech solutions by providing support in building prototypes.

RegtechforregulatorialAccelerator 是一个由 BFAGlobal 管理的非营利性捐助者资助的加速器方案，旨在通过支持原型制造，帮助新兴市场和发展中经济体的金融当局探索具体的供应技术解决方案。

Broeders and Prenio (2018) and Coelho et al (2019).

BroedersandPrenio(2018)和 Coelhoetal(2019)。

See http://vendors.r2accelerator.org/?v=tracker.

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5. **Based on this new set of information, this paper takes a fresh look at suptech and provides an update on developments in this field.** Specifically, Section 2 offers a new definition of suptech – on the one hand broadening it to include more authorities, while on the other hand narrowing it to specific technologies. Section 3 then traces the evolution or the different generations of technology used by financial authorities, which culminates in generations that can be considered as suptech. Section 4 describes the suptech strategies pursued by different authorities. Section 5 and 6 provide an overview of the different suptech use cases, and the manner of development and status of deployment, respectively. Section 7 concludes.
基于这一新的信息，本文对供应链管理技术进行了新的认识，并对该领域的最新发展进行了综述。具体来说，第 2 节提供了一个关于超技术的新定义——一方面扩大了它的范围，包括了更多的权威，而另一方面又把它缩小到具体的技术。第三部分追溯了金融当局所使用的技术的演变或不同时代的技术，这些技术的高潮是可以被认为是超技术的时代。第四部分描述了不同权威机构所采取的超技术策略。第 5 部分和第 6 部分分别概述了不同的超技术用例，以及开发方式和部署状态。第七部分结束。

Section 2 – Suptech redefined
第 2 节-超级科技的重新定义

6. **This paper redefines suptech as the use of innovative technology by financial authorities to support their work**. For the purposes of this paper, the term "innovative technology" refers to the application of big data or artificial intelligence (AI) to tools used by financial authorities, while "financial authorities" refer to both supervisory and non-supervisory authorities.[9] This new definition clarifies the scope in terms of users of suptech (ie including non-supervisory financial authorities such as financial intelligence units) as well as the types of technology used (big data or AI).
本文将超技术重新定义为金融机构利用创新技术支持其工作。就本文件而言，"创新技术"一词是指金融当局使用的工具使用大数据或人工智能，而"金融当局"则同时指监管当局和非监管当局。9 这个新定义澄清了 suptech 的使用者(即包括金融情报单位等非监管金融当局)的范围，以及所使用的技术类型(大数据或人工智能)。

7. **Big data encompasses technologies that significantly increase the volume, variety, velocity and validity of data under management — the so-called four Vs of big data.** Big data involves data sets that are orders of magnitude larger than can be accommodated by common spreadsheet applications.[10] The European Central Bank's (ECB's) AnaCredit project is one example where the boundaries of big data are already being pushed in the context of supervision.[11] This is compounded by many more varieties of data than were previously considered by authorities, including both structured tabular data as well as unstructured web content such as email, images and social media posts (eg "tweets"). The speed or velocity of big data measures not only the time between the generation of data and their collection, but also how quickly it is turned into reports and actions. Finally, validity speaks to the quality of data. To guard against the "garbage in, garbage out" problem, the data must be subjected to validation checks and other quality controls or else they cannot be trusted to deliver accurate and reliable information. Consistent metadata standards, such as the Statistical Data and Metadata eXchange (SDMX) reporting standards in the case of AnaCredit, are crucial in this regard.[12]
大数据包含了能够显著提高数据管理的数量、多样性、速度和有效性的技术，即所谓的大数据的四个 Vs。大数据所包含的数据数量级比一般的电子表格应用程序所能容纳的数据要大得多。10 欧洲中央银行(ECB)的 AnaCredit 项目就是一个例子，在监管的背景下，大数据的边界已经被推开。11 这种情况由于更多种类的数据而变得更加复杂，这些数据包括结构化的表格数据以及非结构化的网络内容，如电子邮件、图片和社交媒体帖子(如"tweets")。大数据的速度或速度不仅衡量数据生成和收集之间的时间，还衡量数据转化为报告和行动的速度。最后，有效性证明了数据的质量。为了防止"垃圾进、垃圾出"问题，数据必须经过验证检查和其他质量控制，否则它们

不能被信任以提供准确和可靠的信息。在这方面，一致的元数据标准，例如 AnaCredit 的统计数据和元数据交换(SDMX)报告标准，至关重要

8. **A big data architecture comprises the processes and systems that enable and govern the collection, processing, storage, analysis and visualisation of data.** To qualify as such, the layers of the architecture must be internally coherent such that each can handle the speed, size and complexity of big data as defined above. Crucially, the architecture must have built-in quality assurance and security features to ensure the validity and integrity of the data from the point of collection to the point of consumption by end users. This end-to-end flow of data should be seamless, speedy and scalable, without bottlenecks, lags or size constraints.

大数据体系结构包括支持和管理数据的收集、处理、存储、分析和可视化的过程和系统。要获得这样的资格，架构的各层必须内部一致，以便每个层都能够处理上面定义的大数据的速度、大小和复杂性。至关重要的是，架构必须具有内置的质量保证和安全特性，以确保从收集点到最终用户使用点的数据的有效性和完整性。这种端到端的数据流应该是无缝的、快速的和可伸缩的，没有瓶颈、滞后或大小限制。

9. **A number of big data tools can be leveraged to construct such an architecture.** Application programming interfaces (APIs) can ferry large volumes of data directly between databases without human

可以利用许多大数据工具来构建这样的架构。应用程序编程接口(api)可以在数据库之间直接传输大量数据，而无需人工

9 However, the paper does not include authorities in charge of monetary or macroeconomic policies that may also be using similar tools. See for example Tissot et al (2015).

然而，该文件并未包括负责货币或宏观经济政策的当局，这些当局可能也在使用类似的工具。参见 Tissot 等人(2015)的例子。

10 Microsoft Excel spreadsheets, perhaps the most ubiquitous format in financial regulatory reporting, are limited to around 1 million rows and 16,000 columns. Similarly, workbooks are limited to roughly 2 gigabytes limit depending on the version.

微软 Excel 电子表格，也许是金融监管报告中最普遍的格式，被限制在大约 100 万行和 16000 列。同样，工作簿的版本限制在大约 2 千兆字节以内。

11 Cœuré (2017).

C ur (2017).

12 European Central Bank (2017).

欧洲中央银行(2017)。

intervention, thereby overcoming the size limitations of file transfer via email or web portals as well as cutting down on time-consuming and error-prone manual submission. Similarly, robotic process automation (RPA), a form of business automation technology driven by robotics software ("bots"), can substitute for laborious validation and transformation of data, further reducing the scope for human error and speeding up data turnover times. Highly efficient and scalable storage solutions, particularly cloud-based computing, can accommodate big data at rest. Advanced document and data management systems such as "data lakes" can also handle unstructured data. Distributed ledger technology (DLT) allows for automatic validation through a consensus algorithm that replicates, shares and synchronises digital data across different locations. Finally, big data visualisation tools such as dynamic dashboards allow for seamless data interrogation with minimal latency, allowing humans (ie financial authorities) to quickly absorb and understand data.

通过电子邮件或门户网站传送文件，从而克服文件大小的限制，以及减少费时和容易出错的手工提交。同样，机器人过程自动化(RPA)，一种由机器人软件驱动的商业自动化技术，可以替代费力的数据验证和转换，进一步减少人为错误的范围，加快数据周转时间。高效和可扩展的存储解决方案，特别是基于云计算的存储解决方案，可以在休息时容纳大数据。先进的文档和数据管理系统，如"数据湖"，也可以处理非结构化数据。分布式分类账技术(DLT)允许通过一个共识算法进行自动验证，该算法在不同地点复制、共享和同步数字数据。最后，动态仪表板等大数据可视化工具允许以最短的延迟进行无缝数据查询，允许人类(即金融当局)快速吸收和理解数据。

Graph 2

图 2

分布式分类账技术(DLT):一个网络，可以安全地建议、验证和记录分布在多个节点上的同步分类账的更改

Robotic process automation (RPA): partial or full automation of manual, rule-based and repetitive human activities by "bots"

机器人过程自动化(RPA):"机器人"对手动、基于规则和重复的人类活动进行部分或全部自动化

Dashboards: customisable, dynamic interactive reporting tools that automatically fetch and render data in meaningful and actionable visualisations

仪表板:可定制的动态交互式报告工具，能够自动以有意义的、可操作的可视化方式获取和呈现数据

Text mining: automated extraction of meaning from textual data

文本挖掘:从文本数据中自动提取意义

Machine learning: automated data analysis enabling anomaly detection, merge-sort, scoring and other use cases

机器学习:自动化的数据分析，支持异常检测分析，合并排序，评分和其他用例

Geographic information systems (GIS): automated analysis of spatial or geographic data

地理信息系统(GIS):空间或地理数据的自动分析

10. **AI is defined by the Financial Stability Board as the theory and development of computer systems able to perform tasks that traditionally have required human intelligence.**[13] In practice, AI can help in the analysis of large and complex data that would otherwise be impossible for humans to perform. It encompasses machine learning (ML), natural language processing (NLP), visual analytics and all of their respective sub-branches. Financial authorities are now exploring or using AI applications, particularly to enable the integration and analysis of large volumes of information from disparate sources. Graph 2 sketches a non-exhaustive mapping of big data and AI technologies (including their definitions)

金融稳定委员会将人工智能定义为能够执行传统上需要人类智能的任务的计算机系统的理论和发展。13 在实践中，人工智能可以帮助分析大量复杂的数据，否则人类无法执行这些数据。它包括机器学习(ML)、自然语言处理(NLP)、视觉分析以及它们各自的子分支。金融当局目前正在探索或使用人工智能应用程序，特别是能够集成和分析来自不同来源的大量信息。图 2 描绘了大数据和人工智能技术(包括它们的定义)的非详尽的映射

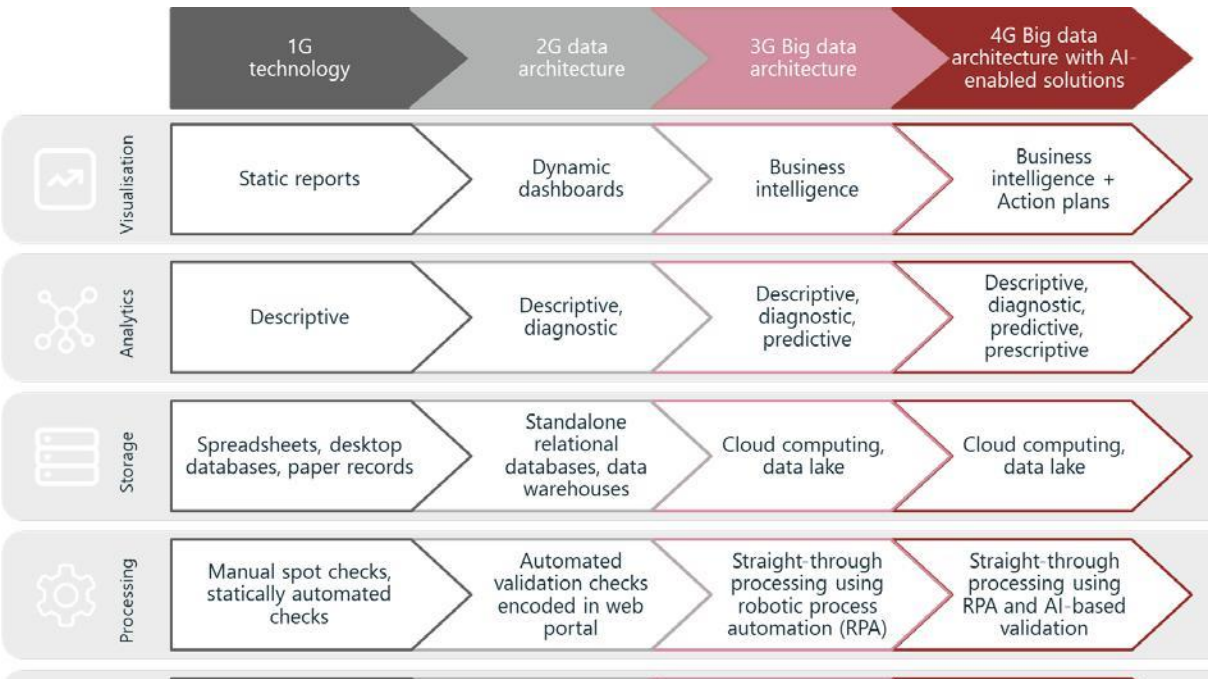
13 Financial Stability Board (2017).
金融稳定委员会(2017)。

and their impact on data. As an example, a "data lake", which is a scalable storage solution for data of various formats, allows the storage of massive volumes and variety of data, thus it is mapped accordingly (ie to both "volume" and "variety").
以及它们对数据的影响。例如，"数据湖"是一个可扩展的存储解决方案，用于存储各种格式的数据，允许存储大量数据和各种数据，因此它被相应地映射(即同时映射到"数量"和"多样性")。

Section 3 – Generations of technology used by financial authorities
第 3 节——金融当局使用的新技术

11. **Not all initiatives examined for this paper meet the definition of suptech suggested above and some could be more appropriately considered as belonging to different "generations" of technology.** Some constitute IT infrastructure upgrades that entail no material increase in the four Vs of big data. Such early generations of data architecture support mostly descriptive and diagnostic analytics
并非本文件所审查的所有倡议都符合上述建议的 suptech 定义，有些倡议可以更恰当地被视为属于不同的"世代"技术。有些是信息技术基础设施的升级，不需要大数据的四个 Vs 的实质性增长。这种早期的数据体系结构主要支持描述和诊断分析
– respectively, "what happened and why did it happen?" – whereas big data and AI enable predictive and prescriptive analytics – "what will happen and what should I do about it?" Depending on the task, the former can still generate both sufficient information and significant efficiency gains while laying the groundwork for a big data architecture and increasing AI readiness. Graph 3 shows the evolution of technological progress in terms of generations of technology used by financial authorities. These are not necessarily discrete categories, but rather a continuum culminating in a big data architecture supporting advanced AI applications. Suptech straddles the third and fourth generations. In particular, third-generation data collection solutions and fourth-generation data analytics solutions are considered suptech for the purposes of this paper.
-"发生了什么，为什么会发生？-而大数据和人工智能使预测性和规范性分析成为可能——"将会发生什么，我应该做些什么？根据不同的任务，前者仍然可以产生足够的信息和显著的效率收益，同时为大数据架构和增加 AI 准备工作奠定基础图 3 显示了技术进步的演变过程，以金融当局所使用的新技术为基础这些不一定是离散的类别，而是一个连续体，最终形成支持高级人工智能应用的大数据架构苏普特克跨越了第三代和第四代特别是，第三代数据收集解决方案和第四代数据分析解决方案被认为是本文的支持技术

Graph 3
图 3



12. **The first generation involves data management workflows that are heavily manual and mostly descriptive analytics.** This has been the starting point for most financial authorities. It involves data collection in which reports are submitted either in paper form or via email, which imposes file size restrictions and introduces operational and security risks. Staff of financial authorities validate data manually (eg "spot checks" or statically automated checks using macros), and extraction, transformation
第一代涉及数据管理工作流程，这些工作流程大部分是手工操作，大部分是描述性分析。这是大多数金融当局的出发点。它涉及数据收集，其中报告以书面形式或通过电子邮件提交，这就限制了文件大小，并带来操作和安全风险。金融当局的工作人员手动验证数据(例如"抽查"或使用宏静态自动检查)，以及提取和转换

and loading (ETL) of data to prepare for analysis are also done manually. Storage is fragmented across disjointed spreadsheets or desktop databases, or in paper records. Data analysis is performed in relatively rigid and simplified spreadsheet models and visualisations are rendered in static reports that require manual updating. Because of data and infrastructure limitations, analytics tend to be descriptive in nature.
和装载(ETL)的数据准备分析也是手动完成的。存储是支离破碎的电子表格、桌面数据库或纸质记录。数据分析是以相对严格和简化的电子表格模型进行的，而可视化是以需要手动更新的静态报告形式呈现的。由于数据和基础设施的限制，分析往往是描述性的。

13. **The second generation covers the digitisation and automation of certain paper-based and manual processes in the data pipeline.** Typically, this involves web-based portals or bulk uploads (eg file transfer protocol) for the submission of regulatory returns coupled with automated validation checks built into the upload protocol. Database rationalisation and the automation of ETL processes to prepare data for analysis are other common features. Some amount of straight through processing allows for more dynamic data visualisation in business intelligence (BI) dashboards, while improved analytical processing allows for deeper diagnostic analysis (eg scorecards) as well as richer descriptive insights.
第二代技术涵盖数据管道中某些纸张和手工程序的数字化和自动化。通常，这涉及到基于网络的门户或批量上传(例如文件传输协议)，用于提交规范性报表，同时内置于上传协议中的自动验证检查。数据库合理化和 ETL 过程的自动化是其他常见的特征，以便为分析准备数据。一些直通式处理允许在商业智能仪表板中进行更动态的数据可视化，而改进的分析处理允许更深入的诊断分析(例如记分卡)以及更丰富的描述性洞察。

14. **The third generation covers big data architecture.** Such architectures are built with technology stacks that support data of higher granularity, diversity and frequency than could be accommodated previously. On the input end, data ingestion and consolidation are fully automated, for instance, using a combination of APIs and RPA. Data storage and computation are optimised for seamless and continuous data interrogation, which may entail the use of cloud storage and "data lakes". Larger data pools coupled with greater computing power enable more advanced statistical modelling, including predictive analytics (eg econometric forecasting).
第三代技术涵盖了大数据架构。这样的架构使用技术堆栈来构建，这些技术堆栈支持的数据粒度、多样性和频率都高于以前可以容纳的数据。在输入端，数据摄入和整合是完全自动化的，例如，使用 api 和 RPA 的组合。数据存储和计算优化为无缝和连续的数据查询，这可能需要使用云存储和"数据湖"。更大的数据池加上更强大的计算能力使得更先进的统计模型，包括预测分析数据库(如计量经济学预测)。

15. **The fourth generation involves the addition of AI as the defining characteristic.** Generally, AI-enabled solutions or tools presuppose an underlying big data architecture since most AI models require large volumes of data and significant computing power for their results to be valid, meaningful and actionable. Hence, digital transformation and big datafication[14] can be considered enablers of AI. Furthermore, the fourth generation takes automation one step further by having "machines" drive parts of data management and analysis, as well as inform authorities' actions. The former might entail leveraging natural language processing to scrape data from the web or using ML to match and merge disparate data sets. The latter can take the form of recommendation engines that suggest courses of action or even chatbots that execute supervisory tasks previously performed by humans, such as responding to and resolving customer complaints.
第四代包括增加人工智能作为定义特征。一般来说，支持人工智能的解决方案或工具预先假定了一个基础的大数据体系结构，因为大多数人工智能模型需要大量的数据和巨大的计算能力才能使其结果有效、有意义和可操作。因此，数字转换和大数据传输可以被认为是人工智能的推动者。此外，第四代通过让"机器"驱动部分数据管理和分析，以及通知当局的行动，将自动化向前推进了一步。前者可能需要利用自然语言处理从网络上获取数据，或者使用机器学习来匹配和合并不同的数据集。后者可以采取推荐引擎的形式，建议行动方案，甚至聊天机器人执行以前由人类执行的监督任务，如回应和解决客户投诉。

Section 4 – Suptech strategies

第四部分-高科技策略

16. **About half of the financial authorities covered in the paper have explicit suptech strategies or are developing them, but approaches vary (Graph 4).** At least two types of approach can be discerned from this study and may be described as (i) specific suptech roadmaps, and (ii) institution-wide digital transformation/data-driven innovation (DT&DI) programmes. These approaches are not necessarily pursued in isolation. For instance, a DT&DI programme can subsume a suptech roadmap. A further distinction among approaches can be made between top-down and bottom-up strategies. In the former, use cases and scope of work have been mostly decided upon in advance. In the latter, solutions emerge by trial and error, diagnostic exercises, or as transplants from the private sector.
报告中提到的大约一半的金融机构都有明确的支持技术战略或者正在制定这些战略，但是方法各不相同(图 4)。从这项研究中可以看出至少有两种方法，它们可以被描述为:(i)具体的超技术路线图，以及(ii)整个机构的数字转型/数据驱动创新(dt&di)方案。这些方法不一定是孤立地采用的。例如，一个 dt&di 程序可以包含一个技术路线图。还可以进一步区分自上而下和自下而上的战略。在前者中，用例和工作范围大多是事先决定的。在后者，通过反复试验、诊断练习或从私营部门移植而得到的解决方案。

17. **Authorities without an explicit strategy tend to pursue suptech projects with an experimental focus or on an ad hoc basis.** These projects are chosen based on the particular needs of individual departments, or in an opportunistic fashion in response to a technological or market development. A menu of methodologies is available to financial authorities that may wish to explore and
没有明确战略的权威机构倾向于追求以实验为重点或临时为基础的超高科技项目。这些项目是根据个别部门的特殊需要选择的，或者是根据技术或市场发展的机会主义方式。金融当局可利用一系列方法，探索和利用这些方法
eventually implement suptech solutions. These include a more institutionalised approach such as
最终实施支持技术的解决方案，其中包括一个更加制度化的方法，如

14 The use of big data infrastructure, tools and processes to enable a data-driven organisation.
使用大数据基础设施、工具和流程，使数据驱动型组织成为可能。

"innovation labs", or one-off programmes such as "accelerators" and "tech sprints", as explained below.
"创新实验室"，或一次性项目，如"加速器"和"科技冲刺"，解释如下。
These methodologies could also be used by authorities with explicit suptech strategies.
这些方法也可以被当局用于明确的支持技术战略。

Graph 4
图 4

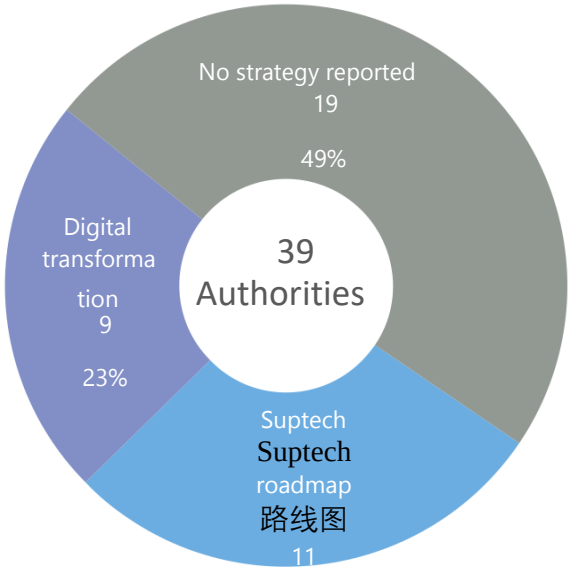


图 11

18. **Specific suptech roadmaps set out a deliberate path to adopting big data and AI processes and systems to support the work of financial authorities.** Generally, this involves (i) making a formal commitment to innovation and setting out a work programme; (ii) selecting and prioritising use cases; (iii) preparing the data architecture (including IT infrastructure upgrades); and (iv) building solutions by way of various development methodologies. This approach is followed by the Australian Securities and Investment Commission (ASIC), and the Monetary Authority of Singapore (MAS), among others. ASIC, for example, has mapped out a succession of initiatives, starting with the establishment of an innovation hub in 2015, followed by "trials", and finally developing and demonstrating tangible suptech tools.
具体的超高科技路线图为采用大数据和人工智能进程和系统以支持金融当局的工作提供了一条深思熟虑的道路。一般而言，这包括(i)正式承诺进行创新及制订工作计划;(ii)选择用例及订定用例的优先次序;(iii)拟备数据架构(包括资讯科技基础设施升级);以及(iv)透过各种发展方法建立解决方案。澳大利亚证券和投资委员会(ASIC)、新加坡金融管理局(MAS)等机构都采用了这种方法。例如，ASIC 制定了一系列计划，从 2015 年建立创新中心开始，接着是"试验"，最后是开发和演示有形的超高科技工具。

19. **Institution-wide DT&DI programmes broadly aim at shifting to automated/digital processes and systems, and adopting advanced data analytics tools.** As the name suggests, institution-wide DT&DI programmes have a broader scope, of which suptech forms part. For instance, Deutsche Bundesbank (DB) is developing a bank-wide digitalisation strategy, to which the banking supervision department contributes by promoting the development of suptech. A similar approach is being pursued by the Bank of Thailand (BOT). On the other hand, the Australian Prudential Regulation Authority's (APRA's) Data Transformation Program (2017–20) seeks to change how APRA collects, stores, uses and innovates with data, in which context suptech solutions are being explored. The Hong Kong Monetary Authority (HKMA) has embarked on a digitalisation programme, with various of its units working on projects. In this context, the HKMA banking departments are considering developing a

suptech roadmap. Other authorities with a similar arrangement are the Central Bank of Malaysia (BNM), and the Bangko Sentral ng Pilipinas (BSP), among others.
全院校的数据分析及数据分析课程，主要目的是转向自动化/数码化程序及系统，以及采用先进的数据分析工具。顾名思义，整个院校的 dt&di 课程的范围更广，其中以后技术课程为主。例如，德意志联邦银行银行正在制定一项全银行范围的数字化战略，银行监管部门通过促进供应链技术的发展为此做出了贡献。泰国央行(BankofThailand)也在采取类似的做法。另一方面，澳大利亚审慎监管局(APRA)的数据转换项目(2017-20 年)试图改变 APRA 收集、存储、使用和创新数据的方式，在这种背景下，正在探索技术支持解决方案。香港金融管理局(金管局)已展开一项数码化计划，辖下多个部门均参与项目工作。在这方面，金管局的银行部门正考虑制订一份支援技术的路线图。其他拥有类似安排的机构包括马来西亚中央银行和菲律宾中央银行储备系统。

20. **Whether or not a financial authority has an explicit suptech strategy, innovation labs allow an innovation centre to be set up within the organisation.** Innovation labs, whether in the form of units or programmes, allow technical solutions to be tested for supervisory use cases in a secure development environment. Generally, they receive dedicated funding and technical assistance from departments across the organisation. The Central Bank of the Republic of Austria (OeNB) has a bank-wide innovation lab where project ideas related to new technologies are evaluated and initiated. The Financial Transactions and Reports Analysis Centre of Canada (FINTRAC) has a data exploitation laboratory aimed at exploring and implementing advanced data analytics solutions. The French Prudential Supervision and Resolution
无论金融机构是否有明确的支持技术战略，创新实验室都允许在组织内建立创新中心。创新实验室，无论是以单位或程序的形式，都允许在安全的开发环境中测试用于监督用例的技术解决方案。一般来说，他们得到来自整个组织各部门的专项资金和技术援助。奥地利共和国中央银行有一个全银行范围的创新实验室，在那里评估和启动与新技术有关的项目构想。加拿大金融交易和报告分析中心(FINTRAC)有一个数据开发实验室，旨在探索和实施先进的数据分析解决方案。法国的审慎监管与处置

Authority (ACPR), on the other hand, operates an "intrapreneurship" programme that aims at encouraging staff members to suggest or lead innovative projects that would improve the ACPR's tools and processes. Selected projects are supported in their design through an innovation methodology provided by the Bank of France's innovation centre, Le LAB.
另一方面，管理局(ACPR)实施了一项"内部创业"计划，旨在鼓励员工提出或领导创新项目，以改进 ACPR 的工具和流程。选定的项目通过法国银行创新中心 LeLAB 提供的创新方法在设计中得到支持。

21. **The use of "accelerators" is another way to explore suptech solutions.** Accelerators are either one-off or ongoing programmes that involve outside parties. They aim to develop explorative proofs of concept (POCs) or prototypes during a defined timeline. As an example, R2A is a donor-funded programme that seeks to help financial authorities in capacity-constrained emerging market economies explore specific suptech solutions. It uses lean design and agile development methodologies together with open-source software to develop scalable prototypes at low cost. The designs of the prototypes are co-created by staff members of the relevant units within a financial authority, R2A consultants and sometimes external vendors specialising in a specific use case. These prototypes then serve as blueprints for the development of a full-scale final product should the financial authority decide to go ahead. The Bank of England's accelerator had a similar objective of developing POCs, including for suptech use cases. The difference was that innovative firms play a lead role in design and development, rather than the relevant units within the bank.[15]
使用"加速器"是探索超高科技解决方案的另一种方式。加速器要么是一次性的，要么是涉及外部各方的正在进行的方案。他们的目标是在一个确定的时间线内发展概念(poc)或原型的探索性证明。例如，R2A 是一个由捐助方资助的方案，旨在帮助能力有限的新兴市场经济体的金融当局探索具体的供应技术解决办法。它使用精益设计和敏捷开发方法，与开源软件一起以低成本开发可扩展的原型。原型的设计是由财务主管部门相关单位的工作人员、R2A 顾问以及有时专门处理特定用例的外部供应商共同创建的。这些原型然后作为蓝图，开发一个全面的最终产品，如果金融当局决定继续进行。英格兰银行的加速器也有类似的开发 poc 的目标，包括用于供应技术的案例。不同之处在于，创新公司在设计和开发方面发挥着主导作用，而不是世界银行内的相关单位

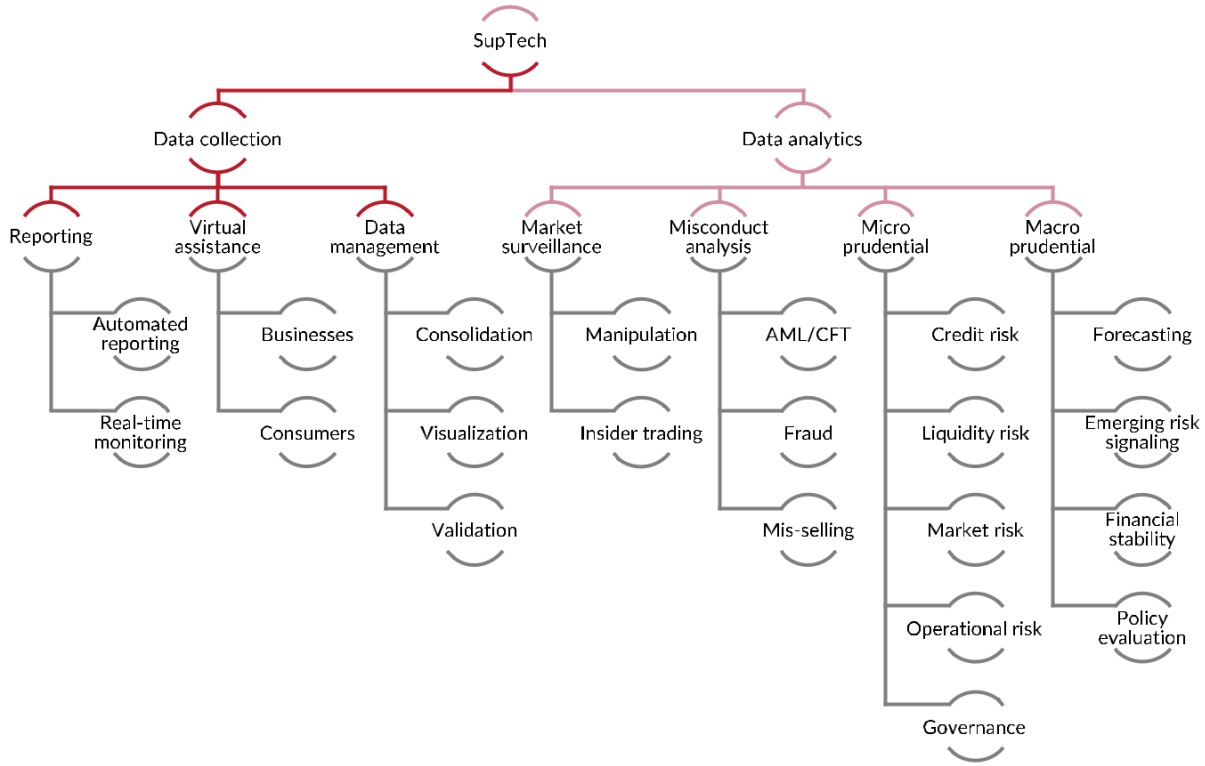
22. **Exploration of suptech solutions may also be aided by "tech sprints" (sometimes referred to as "hackathons" or "codeathons").** Like accelerators, tech sprints seek to develop POCs, albeit in a much shorter time frame. Tech sprints typically take the form of intensive workshops lasting two to five days that bring together in-house and industry experts around specific challenges or use cases. The United Kingdom's Financial Conduct Authority (FCA) has pioneered the use of tech sprints since 2016, including two on the topic of regulatory reporting. The 2017 tech sprint on digital regulatory reporting (DRR) has informed the FCA's initiative to re-engineer its data architecture and replace its existing web portal-based system, which has reached the end of its shelf life. To implement the tech sprints, the FCA receives technical assistance from consulting or technology firms that furnish facilities (eg a venue, high-speed internet), software (eg cloud computing and AI platforms) and synthetic data for the event.
探索支持技术的解决方案也可以借助于"技术冲刺"(有时被称为"黑客马拉松"或"codeathons")。就像加速器一样，技术冲刺寻求开发 POCs，尽管时间要短得多。技术冲刺通常采取为期两到五天的密集研讨会的形式，将内部和行业专家聚集在一起，讨论具体的挑战或用例。自 2016 年以来，英国金融行为管理局(FCA)率先使用技术冲刺，其中两个主题是监管报告。2017 年数字监管报告技术冲刺(DRR)已通知 FCA 的倡议，重新设计其数据结构，并取代其现有的基于门户网站的系统，该系统已经到达其保质期的结束。为落实科技冲刺计划，边境禁区得到顾问公司或科技公司的技术支援，为活动提供设施(例如场地、高速互联网)、软件(例如云端运算和人工智能平台)和合成数据。

Section 5 – Suptech use cases
第 5 节-超高科技用例

23. **The universe of suptech use cases has remained broadly unchanged since the first comprehensive study of the field by Broeders and Prenio (2018).** The same but slightly expanded taxonomy was employed to categorise reported suptech applications according to the primary use (Graph 5). Thus, for data collection applications, end-to-end solutions fall under "reporting", whereas point solutions targeting specific sections of the data pipeline are categorised separately under the corresponding headers (eg validation solutions would fall under "data management"). Only use cases that fall under the definition of suptech provided in Section 2 are included here.
自从 Broeders 和 Prenio(2018)首次对该领域进行全面研究以来，超技术用例的范围基本上没有变化。相同但稍微扩展的分类法被用来根据主要用途对已报告的超高科技应用程序进行分类(图 5)。因此，对于数据收集应用程序而言，端到端解决方案属于"报告"范畴，而针对数据管道特定部分的点解决方案则在相应的标题下单独分类(例如验证解决方案属于"数据管理"范畴)。这里只包括第 2 节中提供的属于 suptech 定义范围的用例。

15 See Bank of England's frequently asked questions on Bank of England accelerator.
看

Graph 5
图 5



24. **The suptech initiatives observed cluster mainly around misconduct analysis, reporting and data management.** Virtual assistance, microprudential, macroprudential and market surveillance make up a smaller share of the sample set (Graph 6). In total, we examined (99) use cases that fall under the new definition of suptech as described above.
超技术主动观察主要围绕不当行为分析，报告和数据管理。虚拟援助、微观审慎、宏观审慎和市场监督在样本集中所占份额较小(图 6)。总的来说，我们检查了(99 个)属于上面描述的 suptech 的新定义下的用例。

Graph 6
图 6

10 超技术世代

Misconduct analysis and market surveillance
不当行为分析及市场监察

25. **New tools are required to combat the new forms of money laundering, terrorist financing, mis-selling and fraud made possible by digital technology.** This need likely explains the preponderance of misconduct use cases. It also reflects the fact that latest-generation suptech solutions lend themselves especially well to misconduct analysis. This is because these solutions generally deal with granular, time-sensitive and hard-to-parse unstructured data, for which big data and AI tools are well suited. In the field of anti-money laundering (AML) and combating the financing of terrorism (CFT), added impetus comes from the global trend of de-risking in correspondent banking relationships, which in part has been driven by weaknesses in AML/CFT regulatory and supervisory frameworks.[16] Coelho et al (2019) provide specific examples of suptech tools for AML/CFT purposes.
我们需要新的工具来打击数字技术带来的新形式的洗钱、资助恐怖主义、不当销售和欺诈行为。这种需求可能解释了不当行为用例的优势。这也反映了一个事实，即最新一代的超高科技解决方案特别适合于不当行为的分析。这是因为这些解决方案通常处理粒度大、时间敏感和难以解析的非结构化数据，这些都是大数据和人工智能工具非常适合的。在反洗钱和打击资助恐怖主义领域，相应的银行关系去风险化的全球趋势增加了动力，部分原因是反洗钱和打击资助恐怖主义的监管和监督框架薄弱。

26. **Among the observed suptech use cases, ML is used to support anomaly detection, network analysis and risk scoring.** Mexico's National Banking and Securities Commission (CNBV) uses a combination of clustering, logistic regression, artificial neural networks and random forest models to detect suspicious patterns in granular transactional and account-level data. It is also experimenting with an NLP tool that flags selected names and companies from news related to money laundering schemes and links these to other data sources, both unstructured (social media) and structured (watchlists, accounts). The United Kingdom's FCA performs network analysis on orders and executions data to construct webs of market participants and identify collusive behaviour indicating insider trading, while the Netherlands Bank (DNB) employs a similar technique to link individuals sending funds to the same counterparties in high-risk jurisdictions along various routes. The Bank of Italy (BdI) is exploring a tool that would apply a combination of network analysis and self-organising map techniques to detect behaviours typical of fraud in the gold declaration database. Meanwhile, FINTRAC has a scoring model that uses geospatial and principal component analysis to rank supervised institutions according to their likelihood of non-compliance with AML rules.
在所观察到的高科技应用案例中，机器学习被用来支持异常检测、网络分析和风险评估。墨西哥国家银行和证券委员会(CNBV)结合使用聚类、Logit 模型、人工神经网络和随机森林模型来检测粒状交易和账户级数据中的可疑模式。它还在试验一种 NLP 工具，该工具可以标记选定的名字和公司，从与洗钱计划相关的新闻中标记这些名字和公司，并将它们链接到其他数据源，无论是非结构化(社交媒体)还是结构化(观察名单、账户)。联合王国的金融监管局对命令和执行数据进行网络分析，以建立市场参与者网络，并查明表明存在内幕交易的串通行为，而荷兰银行则采用类似的技术，将个人沿不同路线向高风险管辖区的相同交易对手提供资金联系起来。意大利银行正在探索一种结合网络分析和自组织地图技术的工具，以发现黄金申报数据库中典型的欺诈行为。与此同时，FINTRAC 有一个评分模型，使用地理空间和主成分分析数据对受监督的机构进行排名，根据它们不遵守反洗钱规则的可能性。

27. **Text mining is a popular ML technique for AML and anti-fraud use cases where parsing voluminous textual data is involved.** The Systematic Integrity Risk Analysis (SIRA) reports submitted by Dutch financial institutions to the DNB are an example of documents that have been subjected to this form of automated textual analysis. ASIC, the Bank of Mexico (BoM), and the FCA also employ a combination of web-scraping and text mining to audit promotional materials, prospectuses or financial advice documents disseminated by financial institutions. MAS has developed an event impact analysis tool that scrapes web data from news sites and uses NLP to automatically detect so-called "hot events" and categorise them as "laundering" or not. MAS and the Czech National Bank (CNB) also use such a solution to check whether initial coin offerings (ICOs) are being marketed to residents in their jurisdictions. One variation explored by ASIC through a trial went one step further by testing voice analytics and voice-to-text (VA&VT) technology to monitor marketing calls for life insurance. The solution promises to analyse, flag and report calls that contain

inappropriate sales tactics such as pressure selling or inaccurate information about products. Similarly, BoM developed a proprietary optical character recognition solution for converting images of trust contracts into text and a text mining tool that will help identify key words.
文本挖掘是针对 AML 和涉及解析大量文本数据的反欺诈用例的一种流行的机器学习技术。荷兰金融机构向荷兰国家银行提交的系统完整性风险分析报告就是采用这种自动文本分析形式的文件的一个例子。Asic、墨西哥银行(BoM)和 FCA 还采用网络搜集和文本挖掘相结合的方式，审计金融机构散发的宣传材料、招股章程或财务咨询文件。Mas 开发了一个事件影响分析工具，从新闻网站中提取网络数据，并使用 NLP 自动检测所谓的“热点事件”，并将其归类为“洗钱”或“不洗钱”。马来西亚金融管理局和捷克国家银行(CNB)也使用这种解决方案来检查首次发行的硬币(ico)是否正在销售给其辖区内的居民。Asic 通过试验探索的一个变化更进一步，测试了语音分析和语音到文本(va&vt)技术，以监控人寿保险营销电话。该解决方案承诺分析、标记和报告包含不适当的销售策略的电话，如压力销售或不准确的产品信息。类似地，BoM 开发了一个专有的光学字符识别解决方案，用于将信任契约的图像转换为文本，并开发了一个文本挖掘工具，帮助识别关键词。

28. **From a market surveillance perspective, a big data architecture makes it possible for financial authorities to perform real-time market transaction monitoring.** Securities market supervisors, such as ASIC and SEC, transform enormous data sets into usable patterns for market surveillance purposes, including in the detection of potential insider trading and market manipulation. For example, ASIC's market analysis and intelligence (MAI) platform collects real-time data feeds from all Australian primary and secondary capital markets (ASX and Chi-X) for equity and equity derivatives products and transactions. The SEC uses analytics that harness the power of big data, primarily for text
从市场监测的角度来看，大数据架构使金融当局能够实时监测市场交易。证券市场监管机构，如 ASIC 和 SEC，将庞大的数据集转换成可用的模式，用于市场监管目的，包括侦测潜在的内幕交易和市场操纵。例如，ASIC 的市场分析和情报(MAI)平台收集来自澳大利亚所有一级和二级资本市场(ASX 和 Chi-X)的实时数据，用于股票和股票衍生产品和交易。美国证券交易委员会使用的分析，利用大数据的力量，主要是文本

16 Financial Stability Board (2015).
金融稳定委员会(2015)。

arising from regulatory filings and tonal analysis, to drive its surveillance programmes. They also foster innovation in market risk assessment initiatives.[17]
来自监管文件和音调分析，以推动其监督计划。它们还促进市场风险评估举措的创新。17

Reporting and virtual assistance
报告和虚拟援助

29. **Reporting use cases can be distinguished between "automated reporting" solutions and "real-time monitoring".** The former draws on advances in big data technology to automate the collection of data from supervised entities, especially prudential returns. Real-time monitoring, by contrast, provides a "live" view of a given supervisory domain. Data collected from virtual assistance solutions help in this regard.
报告用例可以区分为"自动报告"解决方案和"实时监控"。前者利用大数据技术的进步，实现从受监管实体收集数据的自动化，尤其是审慎回报。相比之下，实时监控提供给定监控域的"实时"视图。从虚拟援助解决方案中收集的数据在这方面有所帮助。

30. **Automation is increasingly achieved through APIs, but also other technology that enables machine-to-machine communication.**[18] APRA, BOT, BSP, CNBV, DB, the Central Bank of Brazil (BCB), the Central Bank of Jordan (CBJ), the European Insurance and Occupational Pensions Authority (EIOPA), the Polish Financial Supervision Authority (KNF) and the South African Reserve Bank (SARB) all have API projects under consideration or in the pipeline. Other financial authorities have expressed an intention to adopt them eventually. The OeNB has been pioneering the data cube approach, which the Bank of Greece (BoG) is also exploring.[19] The National Bank of Rwanda (BNR) continues to stand apart for its "data pull approach", which connects the entire financial sector to a centralised electronic data warehouse.
18APRA，BOT，BSP，CNBV，DB，巴西中央银行，约旦中央银行，约旦欧洲保险和职业养老金管理局银行，波兰金融监管局和南非储备银行都有正在考虑或正在进行的项目。其他金融当局已表示有意最终采纳这些措施。Oenb 一直是数据立方体方法的先驱，希腊银行也在探索这种方法。19 卢旺达国家银行(BNR)继续以其"数据拉方法"脱颖而出，该方法将整个金融部门连接到一个集中的电子数据仓库。

31. **Real-time monitoring leverages a mix of APIs, web-scraping, chatbots, text mining and others to fetch data on demand or as a continuous stream.** Real-time monitoring is then coupled with straight through processing and dynamic visualisation to provide an instant read-out of performance indicators. Such solutions go hand in hand with other use cases, in particular with misconduct analysis and market surveillance. For example, the chatbot prototyped by the BSP captures consumer complaints via popular messaging apps and renders summary statistics and performance metrics in a dynamic dashboard near-instantaneously, giving supervisors a live view of market conduct in the domestic banking sector. Similarly, CNBV's and ASIC's market surveillance tools enable real-time monitoring and scrutiny of transaction and fund flows.
实时监控利用各种 api、web 抓取、聊天机器人、文本挖掘和其他技术来根据需要或作为连续流获取数据。然后，实时监控与直通式处理和动态可视化相结合，以提供性能指标的即时读出。这些解决方案与其他用例密切相关，特别是与不当行为分析和市场监督。例如，BSP 的聊天机器人原型通过流行的消息应用程序捕捉消费者的投诉，并在动态仪表板上即时提供摘要统计数据和性能指标，使监管者能够实时了解国内银行部门的市场行为。同样，CNBV 和 ASIC 的市场监督工具能够实时监控和审查交易和资金流动。

Data management
数据管理

32. **Data management use cases refer to suptech initiatives that target specific points in the data life cycle.** This is in contrast with end-to-end solutions that cover the data pipeline in its entirety

(eg real-time monitoring) or focus chiefly on collection (eg automated reporting). The three key data management tasks are validation, consolidation and visualisation.
数据管理用例是指针对数据生命周期中特定点的超技术活动。这与覆盖整个数据管道的端到端解决方案(例如实时监控)或主要侧重于收集(例如自动报告)形成对比。三个关键的数据管理任务是验证、整合和可视化。

33. **Data validation refers to the quality control checks of completeness, correctness and consistency of formatting and calculation in accordance with reporting rules.** Suptech can substitute for time-consuming and error-prone manual "spot checks" or spreadsheet-based formulas, which are unsuited for working with large data sets. Most initiatives combine elements of RPA and ML algorithms that detect atypical data points in submissions. OeNB has applied ML and deep learning algorithms to predict the probability that a data set contains errors that need to be rectified by the reporting entity, as
数据验证是指根据报告规则对格式和计算的完整性、正确性和一致性进行的质量控制检查。Suptech 可以替代耗时且容易出错的手工"抽查"或基于电子表格的公式，这些公式不适合处理大型数据集。大多数项目结合了 RPA 和 ML 算法的元素，用于检测提交的非典型数据点。已经应用机器学习和深度学习算法来预测数据集包含需要报告实体纠正的错误的概率，如

17 Bauguess (2017).
Bauguess (2017).

18 Auer (2019) makes a case for *"embedded supervision"* for automated reporting for blockchain-based financial markets. This is a framework that allows compliance with regulatory goals to be automatically monitored by reading the market's ledger, thus reducing the need for firms to actively collect, verify and deliver data.
奥尔(2019 年)提出了"嵌入式监督"的案例为基于区块链的金融市场自动报告。这一框架允许通过阅读市场分类账自动监测监管目标的遵守情况，从而减少企业积极收集、核实和交付数据的需要。

19 The data cube approach is described in Piechocki and Dabringhausen (2015).
数据立方体方法描述了 piehocki 和 Dabringhausen(2015)。

well as knowledge graphs for master data "plausibilisation" (a method for removing unrealistic or erroneous values).
以及主数据的知识图表"合理化"(一种删除不切实际或错误值的方法)。

34. **Consolidation involves the integration of data from multiple sources and in varying formats.** Here too ML techniques can prove helpful. Disparate data sets often contain relevant information about different dimensions of the same subject (eg a company, an individual) but integrating them can be exceedingly cumbersome. If unique identifiers[20] are not available or are inconsistent across data sets and manual merging is difficult, then ML approaches can be used to match data sets using probabilistic scores. For example, the DB uses both a centralised data platform and ML-based merging techniques to build its so-called "House of Microdata".[21]
整合涉及来自多个来源和不同格式的数据的集成。在这里，机器学习技术也可以证明是有帮助的。完全不同的数据集通常包含同一主题的不同维度的相关信息(例如公司、个人)，但是将它们集成起来会非常麻烦。如果唯一标识符 20 不可用，或者数据集之间不一致，并且手动合并很困难，那么机器学习方法可以用于使用概率得分来匹配数据集。例如，DB 使用一个集中的数据平台和基于 ml 的合并技术来构建其所谓的"微数据之家"

35. **Visualisation use cases refer to interfaces that sit atop big data architectures and provide seamless and interactive user experience with minimal latency.** Often they substitute for static, spreadsheet-generated dashboards that require manual updating. To extract the most meaningful and actionable insights from data, big data dashboards allow for numerous analytical operations, such as drilling up (ie summarising data along one dimension) and drilling down (ie navigating deeper along a dimension), as well as slicing, dicing, pivoting and overlaying data across multiple dimensions. For instance, MAS is developing a supervisory dashboard that simplifies the experience of using data and provides supervisors with "at-a-glance" visibility of the health of the financial institutions in their portfolio. It also enables an easy comparison of performance between different financial institutions and peer groups, alerts users to outliers and/or significant changes of indicators, and allows drilling down to derive deeper insights on certain risks.
可视化用例指的是位于大数据架构之上的界面，它以最小的延迟提供无缝和交互式的用户体验。它们常常替代需要手动更新的静态、电子表格生成的仪表板。为了从数据中提取出最有意义和可操作的见解，大数据仪表盘允许进行大量的分析操作，比如钻孔(即从一个维度总结数据)和钻孔(即从一个维度进行更深入的导航)，以及在多个维度上分割、切割、旋转和覆盖数据。例如，马来西亚金融管理局正在开发一个监督仪表板，以简化使用数据的体验，并为监督人员提供其投资组合中金融机构健康状况的"一目了然"的可视性。它还可以方便地比较不同金融机构和同行之间的业绩，提醒用户注意异常值和/或指标的重大变化，并允许深入研究，以便对某些风险有更深入的了解。

Micro- and macroprudential supervision
微观和宏观审慎监管

36. **Use cases for microprudential supervision seek primarily to leverage ML applications to improve prudential oversight of risks, such as liquidity and credit risks, as well as governance and culture.** The DNB has studied the use of neural networks to detect liquidity problems at banks in anticipation of potential deposit runs.[22] Sentiment analysis tools such as the BdI's twitter-based indicator may also be deployed for this purpose.[23] The Federal Reserve System is experimenting with the use of NLP to identify and extract topical information from voluminous text for microprudential purposes. On the other hand, the Central Bank of the Russian Federation (CBR) has designed software that accelerates the credit risk internal ratings-based (IRB) approach supervision process, for example, by running statistical tests to check the level of accuracy, discrimination and stability of banks' models for calculating capital requirements.[24] Similarly, the BOT has operationalised a credit risk assessment model that applies logistic regression and random forest algorithms to granular data from commercial credit contracts in order to generate a credit score for individual lenders.[25] The BOT has also developed a NLP platform that is used
微观审慎监管的用例主要寻求利用机器学习应用来改善对风险的审慎监管，如流动性和信贷风险，以及治理和文化。荷兰银行研究了利用神经网络检测银行在预测潜在存款挤兑时的流动性问题。

22 情绪分析工具，例如 BdI 的基于 twitter 的指标，也可用于这一目的。23 美国联邦储备系统正在试验使用 NLP，为微观审慎目的从大量文本中识别和提取主题信息。另一方面，俄罗斯银行银行(CBR)设计了软件来加速基于信用风险的内部评级方法的监管过程，例如，通过运行统计测试来检查银行计算资本要求的模型的准确性、区别性和稳定性。24 类似地，BOT 已经实施了一个信用风险评估模型，将 Logit 模型和随机森林算法应用于商业信用合同的粒度数据，以便为个别贷款人生成信用评分。25BOT 还开发了一个 NLP 平台，可以使用

20 The legal entity identifier (LEI), initiated by the FSB, is an important example of unique identifiers. It enables a clear and unique identification of entities participating in financial transactions.

法律实体标识符(LEI)是由 FSB 发起的，是唯一标识符的一个重要例子。它使参与金融交易的实体具有明确和独特的身份。

21 Buch (2018).

Buch (2018).

22 See Triepels et al (2017).

参见 Triepelsetal(2017)。

23 Accornero and Moscatelli (2018).

Accornero and Moscatelli (2018).

24 Central Bank of the Russian Federation (2018).

俄罗斯中央银行(2018)。

25 Bank of Thailand (2018).

泰国银行(2018)。

to analyse executive committee meeting minutes to study corporate governance ("behaviour and culture analysis").[26]
分析执行委员会会议记录，研究公司治理("行为与文化分析")。26

37. **Use cases for macroprudential supervision use similar ML techniques.** The BoG is experimenting with ML and deep learning to anticipate bank insolvencies, essentially creating an early warning system for bank failures that can serve both micro- and macroprudential purposes.[27] The BdI is using ML techniques to analyse real estate ads in a popular online portal to forecast housing prices and inflation. BdI is also exploring the use of deep neural networks to detect potential liquidity problems that might affect payment system participants.
宏观审慎监管的用例使用类似的机器学习技术。英国银行正在试验机器学习和深度学习技术来预测银行破产，实质上是建立一个银行破产的早期预警系统，可以服务于微观和宏观审慎的目的。Bdi 还在探索使用深层神经网络来检测可能影响支付系统参与者的潜在流动性问题。

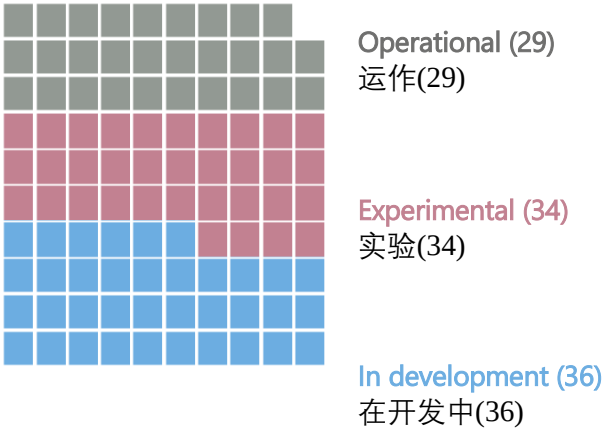
Section 6 – Suptech development and deployment
第 6 节-超级技术的发展和部署

38. **Suptech solutions have emerged only recently, with a marked take-off in 2019.** The emergence of big data- or AI-enabled suptech followed the take-up of regtech by financial institutions. The main impetus for the latter came from efforts by financial institutions to ease a rising regulatory compliance burden, coupled with the growing availability of big data and AI tools. Suptech has generally lagged behind developments in the fintech/regtech space. Aside from a deliberate strategy to sequence and pace IT upgrades gradually, the reasons for the relatively late embrace of suptech may be ascribed to
Suptech 解决方案最近才出现，在 2019 年取得了显著进展。随着金融机构采用 regtech，出现了大数据或人工智能支持的超级技术。后者的主要推动力来自于金融机构为减轻不断增长的守规负担所做的努力，以及大数据和人工智能工具的日益普及。在金融技术/再技术领域，高新技术的发展总体上落后于其他领域。除了有意识地逐步安排 IT 升级的顺序和步伐，对于相对较晚采用超级技术的原因可以归结为
(i) concerns among financial authorities about the uncertain value and risks of suptech; (ii) resource constraints; and (iii) a limited product offering for suptech solutions from a small pool of specialised technology vendors. The inertia inherent in legacy IT systems is another factor.
(i)金融当局关注超科技的不确定价值及风险;(ii)资源限制;及(iii)由少数专门科技供应商提供有限度的超科技解决方案。遗留 IT 系统中固有的惯性是另一个因素。

39. **Less than a third of suptech initiatives covered in the paper are operational, with the majority still either in experimental or development stages (Graph 7).** The experimental nature of many suptech initiatives suggests financial authorities are willing to explore the subject, provided that IT budgets and infrastructure are not unduly compromised. Experimentation takes the form of open-ended innovation programs or projects that result in POCs. POCs are effective in validating ideas with uncertain prospects, paving the way for prototypes and eventually full-scale development. Laboratory-like settings also allow staff to use low- or no-cost software, such as freely available machine learning models in R and Python libraries, to test ideas without expending scarce resources or introducing potential cyber security threats lurking within the open-source code. Once a POC or prototype has demonstrated a minimum viability, the models can either be rigorously inspected for bugs and vulnerabilities through penetration tests or reconstituted in a controlled environment.
论文中所涉及的超技术倡议中，只有不到三分之一是可操作的，其中大多数仍处于试验或开发阶段(图 7)。许多超高科技项目的实验性质表明，只要 IT 预算和基础设施没有受到过度的损害，金融当局愿意探讨这个问题。实验采取的形式是开放式的创新计划或项目，结果产生了 POCs。Pocs 能够有效地验证前景不确定的想法，为原型开发铺平道路，并最终实现全面发展。类似于实验室的设置还允许员工使用低成本或免费的软件，例如 r 和 Python 图书馆中免费提供的机器学习模型，来测试想法，而不会消耗稀缺资源，也不会引入潜伏在开源代码中的潜在网络安全威

胁。一旦 POC 或原型已经证明了最小可行性，模型可以通过渗透测试严格检查漏洞和脆弱性，或者在受控环境中重新构建。

Graph 7
图 7



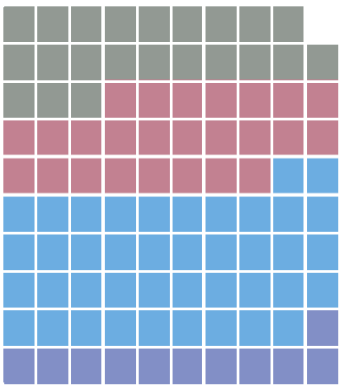
26 Meeting minutes are collected in machine-readable form (PDF and Microsoft Word) via a web portal and stored in the BOT's document and record management system, before they are run through a Python-based topic modelling algorithm.
会议记录以机器可读形式(PDF 和 microsoftword)通过一个门户网站收集，并存储在 BOT 的文件和记录管理系统中，然后通过基于 python 的主题建模算法运行。

27 Petropoulos et al (2017).
Petropoulos et al (2017).

40. **Nearly three quarters of suptech initiatives covered in the paper were or are being developed internally or jointly with external developers and organisations such as universities, with only a quarter under development by external vendors (Graph 8).** This skew likely reflects the experimental and open-ended nature of these projects. Some of these initiatives may lack clearly defined functional requirements or technical specifications (details that are required in traditional "request for proposals") with which to engage outside developers, or sufficient research and development resources with which to entice them. On the supply side, there is a dearth of specialised products or providers in the suptech space. For example, when the United Kingdom's FCA undertook to develop digital regulatory reporting, it could not find a single vendor with the requisite technology or expertise in this space and instead had to launch two tech sprints to incubate the idea. Despite a compelling value proposition and growing demand for suptech solutions, the small addressable market for prospective suptech vendors, both in terms of the quantity of clients and their relative spending power, plus rigid procurement processes and long lead times can discourage private sector participation. Anecdotal evidence also points to a mismatch between financial authorities' needs and outside innovators' capacities.

近四分之三的超高科技项目已经或正在内部或与外部开发商和组织如大学联合开发，只有四分之一由外部供应商开发(图 8)。这种倾斜可能反映了这些项目的实验性和开放性。其中一些举措可能缺乏明确界定的功能要求或技术规格(传统的"征求建议书"所要求的细节)，无法吸引外部开发人员参与，也无法吸引他们参与的足够研究和开发资源。在供应方面，供应技术领域缺乏专业产品或供应商。例如，当联合王国的 FCA 着手开发数字监管报告时，它找不到一个在这一领域拥有必要技术或专门知识的供应商，而是不得不启动两个技术冲刺来酝酿这一想法。尽管有着令人信服的价值主张和对超高科技解决方案日益增长的需求，对于潜在的超高科技供应商来说，无论是在客户数量和他们相对的消费能力方面，还是在严格的采购程序和较长的交货期方面，小规模的可寻址市。轶事证据还指出，金融当局的需求与外部创新者的能力不匹配。

Graph 8
图 8



41. **External vendors mentioned in the survey range from a handful of firms specialising in suptech, to a larger pool of regtech solutions providers and major enterprise IT firms providing commercial off-the-shelf (COTS) solutions.** In a few cases, financial authorities opt for smaller local vendors. What these smaller vendors lack in economies of scale and scope they frequently make up for through lower servicing costs, more customisation, and greater ease of communication and coordination between co-located clients and developers. Data localisation restrictions and public policy objectives for building domestic data science capacity may also factor into procurement decisions.

调查中提到的外部供应商包括少数专门从事超级技术的公司，以及更多的 regtech 解决方案供应商和提供商业现成(COTS)解决方案的主要企业 IT 公司。在少数情况下，金融当局会选择规模较

小的当地供应商。这些规模较小的供应商在规模经济和范围方面的不足，通常是通过降低服务成本、提高定制化程度以及提高共用地点的客户和开发商之间的沟通和协调的便利性来弥补的。数据本地化限制和建设国内数据科学能力的公共政策目标也可能成为采购决定的因素。

42. **Some initiatives take the form of strategic partnerships between financial authorities and other governmental agencies, industry, academia and research organisations.** Such arrangements are especially helpful where there is a common need for data pooling and intelligence sharing. Suptech can help integrate data streams from multiple sources into a common pool from which richer insights can be drawn to serve different user groups. Academic partnerships, meanwhile, can be fruitful for exploratory projects on the cutting edge of suptech research.

一些倡议采取的形式是金融当局与其他政府机构、产业界、学术界和研究机构之间的战略伙伴关系。在共同需要汇集数据和分享情报的情况下，这种安排特别有用。Suptech 可以帮助将来自多个数据源的数据流集成到一个共同的数据池中，从中可以获得更丰富的洞察力，为不同的用户群提供服务。与此同时，学术伙伴关系对于处于前沿的高科技研究领域的探索性项目来说也是硕果累累。

Section 7 – Concluding remarks

第七节--总结

43. **Financial authorities have refined their use of technology over the years, leading to technologies that this paper would consider as suptech.** Authorities have constantly leveraged different

多年来，金融当局已经完善了他们对技术的使用，导致了本文认为是超高科技的技术。政府一直在利用不同的手段

technologies in order to develop tools that help support their work to better carry out their mandates. As outlined in this paper, these technologies have resulted in a range of useful tools, from spreadsheets, desktop databases, dashboards, web-based portals etc all the way to the use of big data architecture and the application of AI. The application of big data or AI to tools used by authorities represents the latest generations of technologies that are considered to be suptech for the purposes of this paper.
技术，以便开发有助于支持其工作的工具，从而更好地执行其任务。正如本文所概述的，这些技术产生了一系列有用的工具，从电子表格、桌面数据库、仪表板、基于网络的门户网站等一直到大数据架构的使用和人工智能的应用。将大数据或人工智能应用于当局使用的工具代表了最新一代技术，这些技术被认为是本文目的的支持技术。

44. **It is important for authorities to continue enhancing existing tools, including those not considered suptech.** Some authorities covered in this paper reported using or developing tools that do not fall under the definition of suptech offered in this paper. However, these tools still represent improvements on the tools used previously. Indeed, authorities can only benefit by taking advantage of advances in technology. Newer technologies enable more efficient processes for data collection and analyses, resulting in more timely and better decision-making. At the same time, the technologies that authorities use should be appropriate to the size, complexity and development of the sectors they oversee. For example, investments in big data architecture and AI tools might not be appropriate for an authority in a low-income jurisdiction that supervises only a handful of financial institutions providing basic financial products and services. Moreover, authorities should also be aware of the issues and challenges associated with suptech, as outlined in Broeders and Prenio (2018). In particular, the lack of transparency in some of the suptech data analytics solutions is a critical issue. This underscores the continued need for human intervention in the form of supervisory expertise to further investigate the results of analyses and when deciding on a course of action.
当局继续加强现有的工具，包括那些不被认为是超高科技的工具，是很重要的。本文所涉及的一些权威机构报告了使用或开发不属于本文所提供的 suptech 定义范围的工具。但是，这些工具仍然代表了对以前使用的工具的改进。事实上，当局只有利用技术进步才能获益。较新的技术能够使数据收集和分析过程更有效率，从而能够更及时和更好地作出决策。与此同时，当局使用的技术应该适合他们监管的行业的规模、复杂性和发展。例如，对大数据结构和人工智能工具的投资可能不适合低收入管辖区的主管部门，因为它们只监督少数几家提供基本金融产品和服务的金融机构。此外，当局还应该意识到与 suptech 相关的问题和挑战，正如在 Broeders 和 Prenio(2018)中所概述的那样。特别是，一些超高科技数据分析解决方案缺乏透明度是一个关键问题。这突出表明，仍然需要以监督专门知识的形式进行人员干预，以进一步调查分析结果和决定行动方针。

45. **Pursuing suptech will help authorities to become more data-driven.** Data are vital for financial authorities. They inform decisions and any actions taken with respect to institutions or markets. Earlier generations of technology resulted in tools that hindered the optimal use of data. This resulted in less efficient data collection and analysis. These earlier tools tended to trap data in silos, and could not exploit newer sources of data or deliver timely insights. Suptech has the potential to address these shortcomings. Big data architecture supports seamless data processes, while AI allows large volumes of information to be integrated from disparate sources and analysed. But the acquisition of such tools needs to be accompanied by a corresponding data expertise and mindset if a data-driven culture is to be successfully embedded in the organisation.
追求高科技将帮助当局变得更加数据驱动。数据对金融当局至关重要。它们为有关机构或市场的决定和任何行动提供信息。早期的技术导致了阻碍数据最佳利用的工具。这导致了效率较低的数据收集和分析。这些早期的工具往往将数据陷入孤岛，无法利用新的数据源或提供及时的洞察力。Suptech 有可能解决这些问题。大数据体系结构支持无缝数据处理，而人工智能允许从不同来源整合和分析大量信息。但是，如果数据驱动的文化要成功地嵌入到组织中，那么在获得这些工具的同时，还需要相应的数据专业知识和思维模式。

46. **There are many ways of exploring suptech tools and these are not mutually exclusive.** Most financial authorities covered in the paper either have suptech strategies in place or are in the process of developing them. Approaches to suptech strategy vary; they range from developing specific suptech roadmaps to incorporating suptech into an institution-wide DT&DI programme. These approaches are

typically pursued in combination. A well defined strategy can help authorities optimally realise the potential benefits of suptech. But for authorities who want to explore specific suptech tools first, before committing substantial resources, there are helpful avenues, such as innovation labs, accelerators or tech sprints. These methodologies can also be included in authorities' existing or future suptech strategies.
有许多方法可以探索支持技术的工具，而且这些方法并不互相排斥。本文所涉及的大多数金融机构要么已经制定了后备战略，要么正在制定这些战略。支持技术战略的方法多种多样，从开发具体的支持技术路线图到将支持技术纳入机构范围的 dt&di 项目。这些方法通常结合使用。一个明确的策略可以帮助当局最佳地认识到供应链技术的潜在好处。但是，对于那些想要在投入大量资源之前首先探索特定的超高科技工具的权威人士来说，有一些有用的途径，比如创新实验室、加速器或技术冲刺。这些方法也可以包括在当局现有的或未来的支持策略中。

47. **Suptech is still in its infancy but it is gaining traction.** The latest big data or AI-centred generations of technology that supervisors are either using or exploring have emerged only recently. In fact, most suptech solutions are still in either the experimental or the development stages. But suptech is gaining momentum. While the universe of suptech use cases has remained broadly unchanged, there seems to be a significant increase in the number of authorities as well as the number of initiatives that are exploring suptech tools.
Suptech 仍处于起步阶段，但正在获得吸引力。管理者正在使用或探索的最新的大数据或以人工智能为中心的一代技术，直到最近才出现。事实上，大多数的高科技解决方案仍然处于实验或开发阶段。但是超高科技正在获得动力。尽管支持技术用例的范围大体上保持不变，但权威机构的数量以及探索支持技术工具的倡议的数量似乎都有了显著的增长。

48. **Suptech tools are applied mainly in misconduct analysis, reporting and data management.** Given the sheer amount of information, big data and ML tools show huge potential to support authorities' activities in misconduct analysis, including in the fight against financial crime. These tools will support financial authorities in better tackling non-financial risks, an area which has inflicted massive reputational damage on financial institutions.
Suptech 工具主要应用于不端行为的分析、报告和数据管理。鉴于大量的信息，大数据和机器学习工具显示了巨大的潜力来支持当局的不当行为分析，包括打击金融犯罪。这些工具将有助于金融当局更好地应对非金融风险，这一领域给金融机构的声誉造成了巨大损失。

49. **The experimental nature of most suptech initiatives may have prevented a greater number of external parties from participating in the development of suptech solutions.** Most solutions are
大多数超高科技项目的实验性质可能阻止了更多的外部参与者参与超高科技解决方案的开发。大多数解决方案都是这样的

being developed within financial authorities, or at least partly using internal resources, with only about a quarter being developed solely by external parties. This may be due to the experimental nature of these initiatives, among other reasons. Consequently, some initiatives may lack functional requirements or technical specifications that are sufficiently defined to engage external parties. Thus, strategic partnerships with other authorities, academia and research organisations will be important in overcoming the challenges associated with the experimental nature of these initiatives.
由金融当局内部发展，或至少部分利用内部资源发展，只有约四分之一纯粹由外界发展。这可能是由于这些倡议的实验性质，以及其他原因。因此，一些举措可能缺乏功能要求或技术规格，而这些要求或技术规格又被充分定义，无法吸引外部各方参与。因此，与其他权威机构、学术界和研究机构建立战略伙伴关系，对于克服与这些倡议的试验性质相关的挑战将是重要的。

50. **International coordination and collaboration could help to accelerate suptech development.** Global standard-setting bodies and international organisations provide platforms for authorities to exchange information on their suptech initiatives. These international platforms could also be used potentially to collaborate on the development of suptech solutions that may be useful to a number of authorities or to address cross-border issues affecting suptech development (eg data localisation). A good example is the recently announced BIS Innovation Hub, which is designed to foster international collaboration on innovative financial technology within the central banking community. Such platforms can help authorities to benefit from peer learning, including from different types of authority (central banks, prudential regulators, conduct regulators etc), helping to offset the lack of specialist providers. They also reduce the need for individual authorities to independently work on similar solutions, thus increasing efficiency. In addition, given the inherently small market for suptech solutions, which limits business opportunities for private IT providers, accelerators set up and/or funded by international organisations can play an important role in helping authorities to explore specific suptech tools.
国际间的协调与合作有助于促进高新技术的发展。全球标准制定机构和国际组织为有关当局提供平台，交流有关其支持技术倡议的信息。这些国际平台也有可能被用于合作开发可能对一些当局有用的超高科技解决方案，或用于解决影响超高科技发展的跨境问题(例如数据本地化)。最近宣布成立的国际结算银行创新中心就是一个很好的例子，该中心旨在促进中央银行界在创新金融技术方面的国际合作。这些平台可以帮助有关当局从同行学习中获益，包括从不同类型的权力机构(央行、审慎监管机构、行为监管机构等)获益，有助于弥补专业提供商的不足。它们还减少了各个主管部门独立研究类似解决方案的需要，从而提高了效率。此外，由于辅助技术解决方案的市场本身就很小，限制了私营 IT 供应商的商业机会，因此由国际组织设立和/或资助的加速器可以在帮助当局探索具体的辅助技术工具方面发挥重要作用。

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Glossary
词汇表

application programming interface: a set of rules and specifications followed by software programmes to communicate with each other, and an interface between different software programmes that facilitates their interaction; APIs enable direct database-to-database data transmission enabling granular, real-time reporting and automated validation.
应用程序编程接口:一套规则和规格，然后是相互通信的软件程序，以及不同软件程序之间的接口，以促进它们之间的交互作用;api 使数据库对数据库的直接接口成为可能，从而实现粒度级、实时报告和自动验证数据传输。

artificial intelligence: the theory and development of computer systems able to perform tasks that traditionally have required human intelligence.
人工智能:能够执行传统上需要人类智能的任务的计算机系统的理论和发展。

big data: a generic term that designates the massive volume of data that is generated by the increasing use of digital tools and information systems. Big data encompasses technologies that significantly increase the volume, variety, velocity and validity of data under management.
大数据:一个通用术语，指的是由于数字工具和信息系统的使用日益增多而产生的大量数据。大数据包含了能够显著增加管理数据的数量、种类、速度和有效性的技术。

chatbot: virtual assistance programmes that interact with users in natural language; chatbots enable automated capture and interpretation of qualitative data, enabling data collection in real time.
聊天机器人:用自然语言与用户互动的虚拟援助方案;聊天机器人能够自动获取和解释定性数据，实现实时数据收集。

cloud computing: use of an online network ("cloud") of hosting processors so as to increase computing capacity and its flexibility.
云端运算:使用在线网络("云端")托管处理器，以增加计算能力及其灵活性。

dashboards: customisable, dynamic interactive reporting tools that automatically fetch and render data in meaningful and actionable visualisations.
仪表板:可定制的动态交互式报告工具，能够自动获取和呈现有意义的、可操作的可视化数据。

data cubes: granular data storage and transmission solution enabling real-time data collection.
数据立方体:支持实时数据收集的粒状数据存储和传输解决方案。

data lake: scalable storage solution for diverse structured, semi-structured, and unstructured data.
Datalake:可扩展的结构化、半结构化和非结构化数据化存储解决方案。

distributed ledger technology: a network to securely propose, validate and record changes to a synchronised ledger distributed across multiple nodes.
分布式分类账技术:分布在多个节点上的同步分类账，用于安全地提出、验证和记录更改的网络。

geographic information systems: automated analysis of spatial or geographic data.
地理信息系统:空间或地理数据的自动分析。

machine learning: a method of designing a sequence of actions, with the aim of solving a problem, that optimise automatically through experience and with limited or no human intervention. ML enables automated anomaly detection, merge-sort, scoring and other use cases.
机器学习:一种设计一系列动作的方法，目的是解决一个问题，这些动作通过经验自动优化，不需要或有限的人工干预。机器学习可以实现自动异常检测、合并排序、评分和其他用例。

natural language processing: an interdisciplinary field of computer science, artificial intelligence and computation linguistics that focuses on programming computers and algorithms to parse, process and understand human language.

自然语言处理:计算机科学、人工智能和计算语言学的一个交叉学科领域，专注于编写计算机程序和算法来解析、处理和理解人类语言。

network analysis: the process of investigating structures through the use of networks and graph theory.
网络分析:利用网络和图论研究结构的过程。

robotic process automation: partial or full automation of manual, rule-based and repetitive human activities by robotics software or "bots".
机器人过程自动化:通过机器人软件或"机器人"对手动、基于规则和重复的人类活动进行部分或全部自动化。

self-organising maps: a type of artificial neural network that is trained using unsupervised learning to produce a low-dimensional, discretised representation of the input space of the training samples, called a map, and is therefore a method of performing dimensionality reduction.
自组织映射:一种人工神经网络，利用非监督式学习来产生训练样本输入空间的低维离散表示，称为映射，因此是一种执行降维的方法。

smart contracts: programmable applications that can trigger financial flows or changes of ownership if specific events occur.
智能合同:可编程应用程序，如果发生特定事件，可触发资金流动或所有权变更。

text mining: the process of exploring and analysing large amounts of unstructured text data aided by software that can identify concepts, patterns, topics, keywords and other attributes in the data.
文本挖掘:利用软件探索和分析大量非结构化文本数据的过程，软件可以识别数据中的概念、模式、主题、关键字和其他属性。

web portal: static file upload via web site with built-in automated validation checks.
门户网站:静态文件上传通过网站与内置的自动验证检查。

web scraper: automated capture of web data by programs or "bots".
网络抓取器:程序或"机器人"自动捕获网络数据。