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TRANSFORMING FINANCIAL SUPERVISION WITH AI: INSIGHTS FROM THE EU

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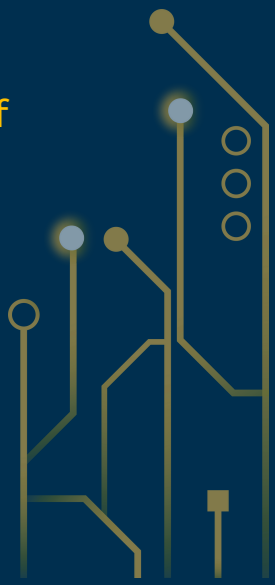

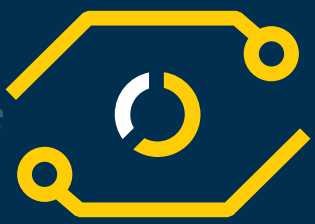

EU Supervisory Digital Finance Academy

The article "Transforming Financial Supervision with AI: Insights from the EU" offers an in-depth analysis of how financial supervisory authorities across the European Union adopt artificial intelligence to enhance supervisory technologies. It draws on the Cambridge SupTech Lab's 2024 State of SupTech Report findings, providing a deep dive into the state of AI adoption, maturity, and capacity building within supervisory bodies.

This article, part of the e-book: "Digital Finance in the EU: Navigating New Technological Trends and the AI Revolution", was developed through a unique collaboration between the Lab and the Florence School of Banking and Finance at the European University Institute (FBF-EUI), for the EU Supervisory Digital Finance Academy (EU-SDFA). EU-SDFA is a capacity-building initiative launched by the European Commission in collaboration with the European Supervisory Authorities (EBA, ESMA, EIOPA) and FBF/EUI. It provides comprehensive training on Digital Finance to foster a shared culture among EU financial supervisors, involving over 1,000 participants from 37 national authorities across 26 Member States.

Transforming Financial Supervision with AI: Insights from the EU

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The rapid advance and widespread adoption of AI technologies have been driven by the recent availability of vast unstructured data, significant increas- es in computing power and a surge in funding of innovative tech projects (Bahoo et al., 2024). Given the heavy reliance of the financial sector on big data and process automation, financial institutions have greatly benefited from these technological advances. Machine learning and deep learning models are applied to asset pricing, credit scoring and risk analysis, creating efficiencies and new business opportunities (CRS, 2024).

The changes brought about by AI, particularly machine learning, are also impacting the way financial supervisors oversee the market conduct and prudential behaviour of financial firms, thus improving current supervisory technology (SupTech) tools. Supervisors are recognising the potential for AI to enhance compliance and safety while being vigilant about its possible misuse to circumvent regulations. The development of AI challenges supervisors to stay abreast of industry advances and offers them opportunities to deploy their resources more efficiently and effectively to fulfil their mandates (Wall, 2018).

Specifically, AI has the potential to enhance macroprudential policy by developing advanced risk assessment models and improving our ability to predict institutional failures and detect market manipulation. The strength of machine learning and other AI-powered tools in recognising patterns in large datasets makes them valuable for supervisors to prospectively identify emerging risks (Aldasoro et al., 2024). Furthermore, these types of tools have the potential to provide efficiency gains in regulatory reporting and compliance by auto- mating repetitive tasks and reducing costs for agencies and supervised entities (Beerman et al., 2021).

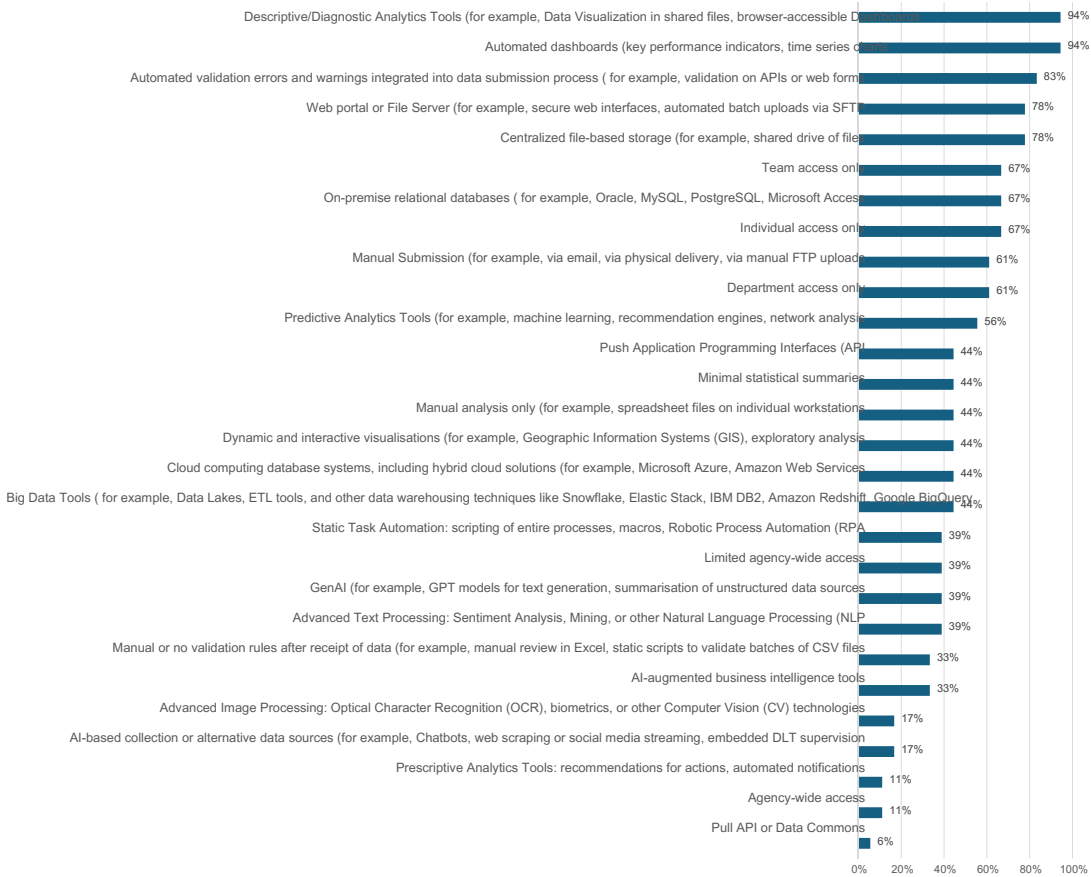
In order to measure SupTech adoption and the prevalence of AI-powered tools in the day-to-day activities of financial authorities, the Cambridge SupTech Lab (the Lab) has been producing a State of SupTech (SOS) Report since 2022. The SOS Report presents insights into the digital transformation of financial supervision and supervisory authorities worldwide. (Cambridge SupTech Lab, 2023).

The SOS Report is more than just an analysis; it is a collaborative tool for the entire ecosystem. In the latest version, the Lab included the Florence School of Banking and Finance as a technical partner, enriched the survey questions, showcased its capacity-building initiatives and increased the capillarity and reach of the report in the EU member states. The sample for the EU includes the European Central Bank and 17 national competent authorities, each in a different country. Respondents included 14 central banks, two financial supervisory authorities and two securities commissions.

The SOS Report is an extensive tool that provides a global perspective on suptech. It addresses a range of topics, including the supervisory use cases facilitated by SupTech, the challenges and enablers associated with digital infrastructure and technologies, and the processes that enhance the digital transfor- mation of supervisory agencies. The 2024 SOS Report has two main sections. The first section covers fundamental questions about the SupTech landscape, supervisory areas, challenges, risks and technologies, consistent with previous editions for longitudinal analysis. The second section delves into specialised topics and offers detailed insights into AI, generative AI (GenAI), data govern- ance, the data journey, collaboration and capacity building. For this chapter, we selected questions from both sections to measure AI adoption in SupTech and the main challenges faced on this journey. The SOS Report did not reveal specific answers at the EU member state level.

Figure 1 displays experimentation with AI at the National Competent Authority (NCA) level. For instance, a third of NCAs use AI-augmented business intelligence tools, and 17% use AI-based collection or alternative data sources (e.g. chatbots, web scraping, social media streaming or embedded DLT supervision). In comparison, 39% of respondents use GenAI (e.g. GPT models for text generation or summarisation of unstructured data sources). Interestingly, 56% of the agencies implement predictive analysis tools (e.g. machine learning, recommendation engines, network analysis) and 39% use advanced text processing (e.g. sentiment analysis, mining or other natural language processing).

Figure 1: What underpinning tools, techniques and technologies does your agency use to enable supervisory processes?



This zoom-in on the data stack of NCAs reflects the significant adoption of AI-driven supervisory methods in the region. The high adoption rates demonstrate successful integration, regulatory compliance and resource allocation.

Furthermore, these results show a solid commitment to leveraging AI capabilities in supervisory tasks.

The integration of AI in SupTech is in its early stages. The survey data show widespread deployment of AI by only 14% of NCAs, but with continual improvement, and no agency reports that AI is fully integrated and optimised in their processes. Around 71% of NCA pilot projects have limited deployment, and 14% are in the initial phase of exploration and research into AI applications. These results suggest a cautious and incremental approach to AI adoption, with agencies focusing on understanding and testing the abilities of AI before committing to full-scale implementation.

The data reveal that machine learning and natural language processing (NLP) are the most commonly adopted AI technologies used by most agencies in the EU for tasks such as predictive analytics and text analysis. Automating regulatory reporting processes and monitoring financial transactions are notable AI application areas. Meanwhile, AI applications in audio processing and computer vision tools are less frequently used. This distribution strongly emphasises leveraging AI for data analysis and regulatory compliance in the EU.

In the only question on the effects of the regulatory environment on SupTech implementation, the SOS Report asked if the existence or absence of AI regulations impacts agencies' strategy concerning adopting SupTech. The answers provide several important insights. First, 28.6% of agencies find that clear regulations accelerate their adoption of SupTech by providing a safe framework. This suggests that well-defined regulatory guidelines boost confidence and facilitate faster implementation. Another 14.3% of agencies find that collaborating with regulatory bodies to align their strategies better is beneficial. This shows the importance of cooperation between agencies and regulators to ensure the smooth adoption of SupTech.

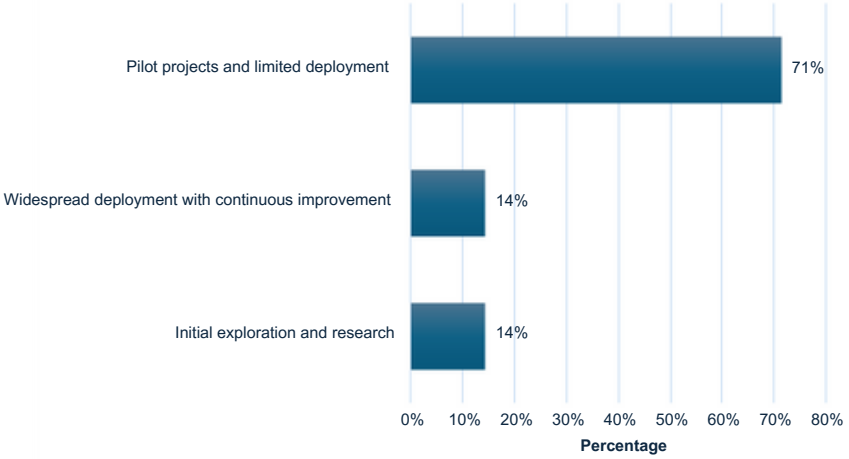
Conversely, 14.3% of NCAs also report that strict or unclear regulatory requirements hinder the adoption of SupTech, indicating that over-stringent or ambiguous regulations may create barriers to implementation. Overall, these responses reflect the diverse ways AI regulations influence the adoption of SupTech by agencies in the EU, revealing a need for clear and supportive regulatory frameworks and collaborative efforts.

In addition, NCAs were asked about the maturity level of their implementation of GenAI in SupTech applications. Most financial supervisors are either in the early stages of exploring GenAI or are conducting pilot projects. Specifically, half the institutions are in the initial exploration and research phase, suggesting that many are still trying to understand and experiment with GenAI technologies. A significant proportion, 36%, are engaged in pilot projects or limited deployment, indicating that while some institutions have moved beyond initial exploration, they are still in the testing and evaluation phase.

Meanwhile, 15% of the institutions have not implemented GenAI, possibly due to a lack of resources, expertise or perceived need. Only a tiny fraction, 2.5%, have achieved widespread deployment and continually improved their GenAI systems, which shows that fully mature GenAI implementations are still rare. This overall distribution suggests that GenAI is still an emerging technology with great potential.

According to a Financial Stability Institute (FSI) study, supervisory authorities are exploring new technologies to develop more user-friendly tools. Many are experimenting with GenAI to create chatbots to assist supervisors – and eventually the public – in finding, summarising and interpreting laws and regulations and to establish database co-piloting that allows supervisors to locate data using natural language, thus eliminating the need to learn programming languages (Prernio, 2024).

Figure 2: What is the maturity level of AI implementation in your agency's SupTech applications?



EU NCAs report several challenges in integrating AI in their supervisory processes. Integrating existing systems and workflows is the most prevalent issue affecting all the agencies answering this question. High implementation costs, resource requirements and limited computing resources further complicate the adoption of AI. Other notable barriers faced when deploying AI include poor data quality, limited technological capacity and a lack of transparency in AI systems, which is often referred to as the 'black box' problem.

One of the main challenges in adopting and integrating AI in SupTech is a need for skilled workers and initiatives to enhance the expertise of current staff, as nearly half the respondents highlighted these issues. It is of utmost importance to address concerns about talent acquisition and skill enhancement. There is a critical need for enhanced training and skill development programmes to upgrade the AI literacy and technical competences of supervisors – an agenda that the EU-SDFA continues to promote.

Such programmes can ensure that supervisors develop the necessary skills to effectively leverage AI by focusing on real-world applications to bridge the gap between theoretical knowledge and practical implementation.

Figure 3: Has your team undertaken capacity building or other programmes on data science in SupTech applications?

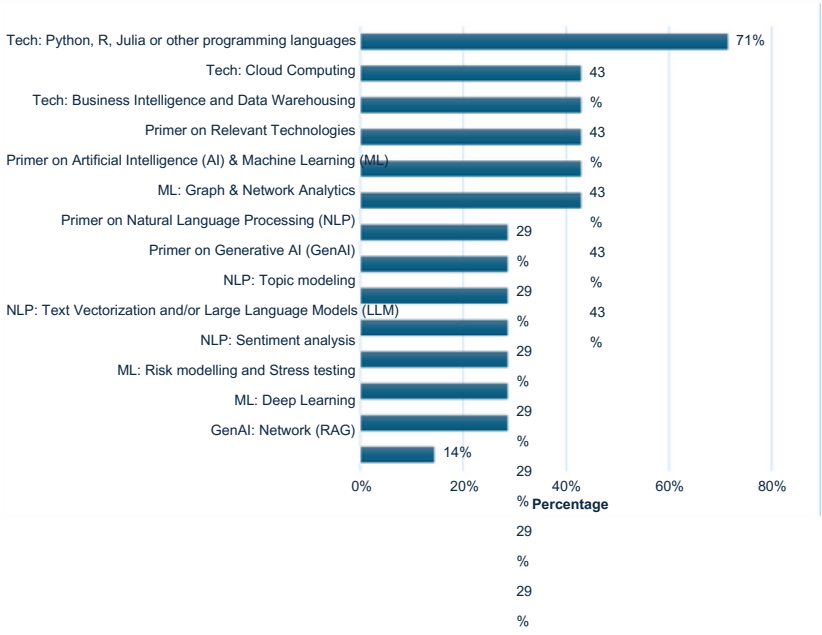


Figure 3 shows the variety in training preferences and reveals the commitment of NCAs to building comprehensive AI abilities in multiple domains. The most sought-after training – in programming languages such as Python, R and Julia – indicates a robust foundational need for technical skills. There is also significant interest in machine learning, particularly in graph and network analysis, risk modelling and deep learning. In addition, agencies are keen to un- derstand NLP techniques, including sentiment analysis, text vectorisation and topic modelling. Training in generative AI, business intelligence, data ware- housing and cloud computing is also in considerable demand.

Meeting the demand for technical skills can also mitigate the 'black box' challenge by promoting the development and use of transparent and explainable AI systems. When developers and data scientists are well-trained, they are better equipped to help develop more explainable and trustworthy AI. This means they can build AI models that clearly show how decisions are made, rather than being mysterious or opaque (Vorras and Mitrou, 2021).

In an open-ended question NCAs were asked to identify the anticipated challenges in implementing SupTech. One of the predominant themes that emerged was the integration of AI technologies. One of the primary obstacles is limitation of resources, both financial and human. Developing, deploying and maintaining sophisticated AI-driven tools require substantial investment, and budget constraints can limit the speed and scope of implementation. In addition, the need for highly specialised skills in AI and data science adds another layer of complexity in future implementation of SupTech as competition for talent in these fields is fierce. Keeping up with the rapid pace of technological advancement is also a challenge, as what is cutting-edge today may become obsolete tomorrow. This requires continual learning and development to ensure that the workforce remains up to date with the latest technologies and methodologies.

Finally, NCAs state that as they transition to more tech-driven supervision, they must ensure compliance with existing regulations and maintain robust data security protocols. Using AI and big data analysis introduces new regulatory challenges, particularly regarding privacy, transparency and accountability. It is essential to ensure that AI tools operate within the law and respect regulations such as the GDPR and the AI Act. In addition, it is vital to find the right balance between leveraging technology and maintaining the critical role of human judgment. While AI can significantly enhance capabilities, it is not infallible, and over-reliance on technology can lead to blind spots or a false sense of security. Therefore, it is crucial to continue valuing and investing in human expertise to ensure effective supervision.

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