

INDEPENDENT EVALUATION OFFICE

OIE EVALUATION OF DATA GOVERNANCE, MANAGEMENT AND USE AT THE BANCO DE ESPAÑA

Banco de España Independent Evaluation Office (OIE)

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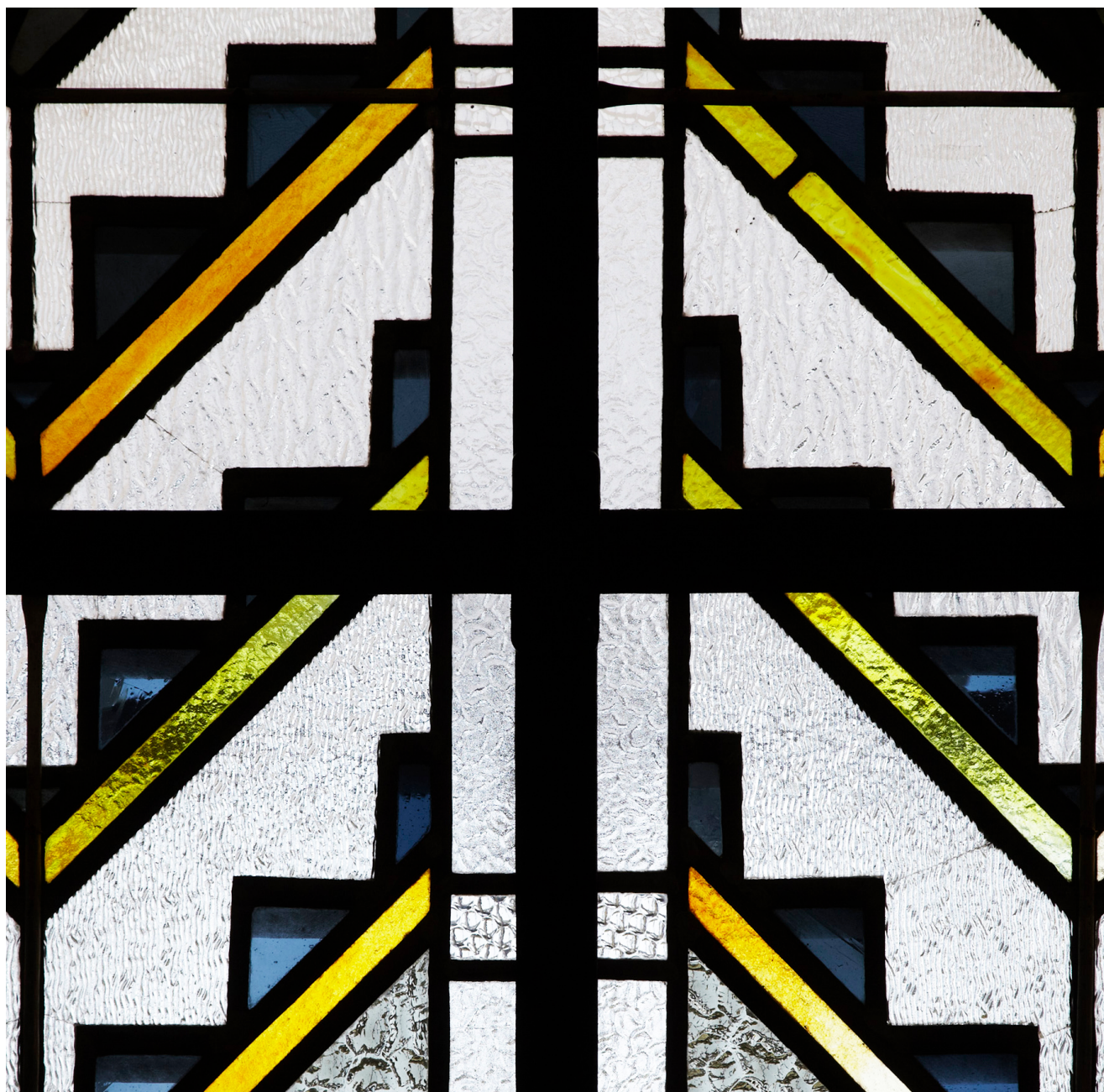


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Foreword of the Governing Council

Data are a strategic asset for the Banco de España, as they are essential for it to effectively carry out its functions. In the coming years, the Bank faces the challenge of strategically managing an ever-growing volume of data from different sources and leveraging them more intensively. At the same time, it must strike a balance between data protection and data availability to ensure that they are used as efficiently as possible. Technological advances, the digital transformation and data science innovations now enable information to be harnessed more efficiently and made more readily accessible across the Bank.

To address these challenges, the Banco de España is striving to become a data-based and data-driven organisation that affords data the importance and treatment they require, recognising them as an asset to be shared with the entire organisation. In recent years the Banco de España has implemented several key measures aimed at strengthening its data governance and management practices, including the **creation of a Data Office and the appointment of a Chief Data Officer** in March 2024. These efforts have been further supported by the **new Strategic Plan 2030**, which includes initiatives to **equip the Bank with advanced technologies and place data at the heart of the organisation.**

Against this backdrop, the Banco de España Governing Council tasked the Independent Evaluation Office (OIE) with conducting an evaluation to determine whether the Bank is on the right track and to issue relevant recommendations for improvement.

The evaluation results were presented to the Governing Council in June 2025. In its report, the OIE highlighted as a positive aspect **the Bank's commitment to becoming a wholly data-driven organisation**, capable of extracting value from data and integrating emerging technologies, such as artificial intelligence (AI). It also underlined the **breadth of the Bank's data asset portfolio**, which includes macroeconomic statistics, financial surveys of households and firms, prudential data and a credit register with monthly information on more than 70 million instruments.

However, the OIE also identified **areas for improvement, grouped into four categories: data fundamentals, technology, talent and culture.**

For the first one, it recommends **promoting a corporate data strategy** and establishing a **comprehensive governance framework** to ensure its effective implementation.

In response to its recommendations, the Banco de España is developing a **three-year data strategy that addresses the Bank's needs (outlined in the Strategic Plan 2030) and is aligned with its technology strategy.** The data strategy will include procedures to swiftly manage data requests through a single channel. In parallel, the Bank **will implement a data**

governance framework that includes a catalogue, metadata standards, master and reference data, terms of use and a quality programme, and data governance for AI.

On the technology front, recommendations include **aligning the technology strategy with the data strategy**, defining a **cloud strategy** and developing a **data lake strategy**. The OIE also advises **investing in modernising IT systems and phasing out obsolete ones**.

To implement the proposed measures, a **five-year technology strategy**, aligned with the data strategy, has been developed under the Strategic Plan 2030. This strategy envisages **adopting a hybrid cloud** and launching a **modernisation plan to replace, within five years, applications currently handling 70% of the data**. A **data lake strategy** will also be defined and approved, including a plan for the gradual incorporation of the target collections, the publication of a catalogue and the definition of a common data model for the entire organisation. Collections within the data lake will be protected through security measures, anonymisation and access controls and will undergo automated processes to ensure quality. **Additional technological solutions**, such as governance tools and a virtualisation platform, will also be implemented. The **governance structure for technological projects and investments** will be updated, with improvements in cost reporting to enhance business areas' understanding of their technological costs.

With regard to talent, the OIE recommends **revising the data capability framework**, designing a **long-term training plan** to close existing gaps in the various Banco de España areas and establishing a **strategy for recruiting and developing specialised talent**.

To address these suggestions, the Bank will introduce a **new role architecture** that incorporates **specific data skills**, which will become a standard requirement in its recruitment processes. Additionally, the Bank **will create Data and Artificial Intelligence Academies, with a basic programme that will be mandatory** for all staff, an intermediate programme and an advanced programme for experts. The Bank has already hired **professionals with expertise in cloud architectures, data lake management and data governance** following a recruitment process for technology experts. A recruitment process is also under way for **data scientists**.

To improve the data culture, it is recommended that the Bank have an **accessible, up-to-date and easy-to-use Data Portal**. Likewise, the Bank is encouraged to foster **cross-departmental communities** to break down silos and promote the management of data as a shared asset, with **clear policies that guarantee they are properly protected and exchanged**. A **culture of continuous improvement is advised over one focused on perfection**. Finally, a horizontal vision should also be introduced to favour a **more streamlined organisational structure**.

The recently launched **Data Portal** includes all the **Bank's information on data production and analysis**, ensuring it is available and accessible to employees. Moreover, the Banco de España plans to create a dedicated space for sharing code related to this analysis. **As part**

of the data strategy, data communities will be established and a communication plan will be drawn up to emphasise the importance of data and data sharing. **The Security Policy and Data Policy will also be brought into line** with each other, incorporating terms of use for data collections and criteria for anonymising sensitive information. Moreover, the Strategic Plan 2030 envisages a **redesign of processes and a reinforcement of the culture of continuous improvement**, introducing **new organisational approaches**, such as matrix governance and cross-departmental teams, aimed at breaking down silos.

The Governance Council has welcomed both the evaluation report and the action plan submitted in response to it by the Banco de España's management. Implementation of these measures will be overseen by the Council through the OIE monitoring programme, ensuring tangible progress in improving data governance, management and use at the Banco de España.

Executive Summary

Over the past three decades, organisations, including central banks, have undergone successive waves of transformation —first driven by data, then digitalisation, and now artificial intelligence. These technological revolutions take time to integrate effectively, and in most cases, implementation has been fragmented and piecemeal. Two common pitfalls consistently undermine progress: embarking on transformation without a clear objective and failing to invest in the capabilities needed to support it.

Successful and sustainable data-driven transformation requires five key enablers: skilled workforce, strong technology infrastructure, sound governance, broad access to data capabilities, and dedicated time for training and collaboration.

The Banco de España has long recognised the importance of data, and its role in supporting its mission. In the current context of technological transformation, the Bank aims to become a fully data-enabled institution, capable of leveraging data and emerging technologies, such as artificial intelligence. To pursue this ambition, it has already taken several important steps to strengthen its data governance and management practices. These include the appointment of a Chief Data Officer (CDO), the creation of the Data Office, and the establishment of the Data and Users Committee. This vision is further reinforced in the Strategic Plan 2030, which underscores its commitment to equipping the organisation with some of the latest technologies.

While progress has been made, and the Bank stands out among its peers for the high quality of its analysis —a strength consistently recognised in previous independent evaluations— it still faces significant challenges to keep up with the rapidly evolving data landscape. Its ability to integrate and utilise data across departments remains limited, as does its capacity to leverage modern data analytical tools and AI.

According to a recent maturity assessment and interviews with leading central banks, the Bank appears less prepared than its peers to keep pace with the fast-changing environment, as it lags in managing, leveraging, and embedding data into decision-making processes. These banks faced similar challenges and took similar steps years ago but have since made substantial additional progress in modernising their data practices. This improvement has enabled them to use data more effectively, putting them ahead in adapting to emerging challenges.

To close this gap and achieve its ambition, we propose ten recommendations organised into four themes: Data Foundation and Fundamentals, Technology, Talent and Culture¹. Whereas some suggestions are relatively straightforward and can be implemented in the short term, others will demand greater investment and be rolled out gradually over the medium to long term.

¹ Talent and Culture related challenges have been highlighted in previous evaluations and are not limited to the data field, but extend to other activities in the Bank.

In its journey the Bank should consider as a priority three particularly sensitive and challenging elements: (i) pursuing cutting-edge technologies without first establishing the necessary foundational capabilities; (ii) the complexity of the organisation, which acts as a significant barrier to progress; (iii) talent —both in terms of attracting and developing the necessary skills. Some of these challenges have already been recognised and are intended to be addressed through the data strategy being developed by the Data Office and several initiatives of the Strategic Plan 2030. However, there are currently still issues preventing the Bank from making strides toward its data goals.

With the right focus and visible and vocal senior leadership commitment to modernisation and cultural change, the Banco de España cannot only close the gap but also position itself as a leader in leveraging data to support its mission.

The table below provides a summary list of all our recommendations. Further elaboration is in the main body of the document.



Theme 1: Establish strong data foundations with clear strategies for smarter decisions.

- R1. Promote a bank-wide data strategy.
- R2. Develop and implement a comprehensive data governance framework to enable the data strategy.



Theme 2: Provide technology capabilities and innovation suitable for data ambitions.

- R3. Align the technology and data strategies.
- R4. Invest to modernise technology and remove outdated systems.



Theme 3: Ensure employees embody top talent to drive data excellence.

- R5. Revise the data skill framework.
- R6. Build a long-term training plan to close the gap in data skills across the organisation.
- R7. Develop a forward-looking strategy for hiring and nurturing data talent.



Theme 4: Create and celebrate a transformed culture from risk averse silos to data driven collaboration.

- R8. Improve day to day data communication and collaboration within the Bank.
- R9. Focus on improvement, not perfection.
- R10. Add a horizontal view to a simplified organisational structure.

1 Overview

Central banks rely on data to support their mandates. As public institutions entrusted with key economic, supervisory and financial responsibilities, they depend on data to effectively perform their functions: from economic forecasting and monetary policy to prudential oversight and financial stability. The strategic value of data is not only internal —it directly contributes to the institution’s ability to promote societal wellbeing. The Banco de España’s current data ecosystem already supports core decision-making processes: it feeds monetary policy, economic analysis, and supervisory work.

The shift toward more open and extensive data use introduces new challenges to central banks, including the Banco de España. As data volumes increase and more information is needed to be shared internally and externally, central banks must ensure robust governance to protect data privacy and security —that is, confidentiality, integrity and availability. New economic and fiscal challenges may require additional data activities that will tax the current environment.

The Banco de España holds an expansive portfolio of data assets. Its data collections include macroeconomic statistics, household and corporate financial surveys, prudential data, a credit register with monthly reporting on more than 70 million instruments, and access to external sources such as legal registries, tax data, and national statistics. These assets cover virtually all aspects of the Bank’s mission and, when combined with the institution’s deep subject-matter expertise, represent a powerful foundation for informed decision-making.

However, much of this potential remains untapped due to fragmented data practices, duplication of efforts, and lack of integration across departments. Addressing these issues requires a more strategic, coherent, and cross-cutting approach to data. The need for integration became clear during the DANA flooding crisis. When data from different parts of the organisation were brought together, the Banco de España was able to monitor the situation in real-time and respond more effectively. Despite the difficulties of this exercise due to the reasons outlined in the following section, the example illustrates the practical value of dismantling internal silos and building a culture of shared information. In today’s environment —where demand for immediate access, increased availability, and user self-service is growing rapidly—such an approach is not only beneficial, but essential.

Against this background, the Governing Council of the Banco de España asked the Independent Evaluation Office (OIE) to conduct an external evaluation of its data governance, management and use. To carry out this evaluation, the OIE was supported by a panel of experts composed by San Cannon (Cannon Analytics, LLC), David Craig (former CEO Refinitiv), and Roberto Rigobon (MIT).

The [terms of reference](#) define the evaluation's objectives, which include assessing the adequacy of the data governance, the efficiency of data management policies and the quality of data; reviewing the organisation's data culture and training; appraising the internal and external data coordination mechanisms, and examining the technological infrastructure to support effective data storage and use.

As part of the evaluation, the OIE carried out a wide-ranging evidence-gathering exercise using three primary sources:

- **Interviews and benchmark survey.** Around 54 interviews across the Bank, including the Governor, Deputy Governor, staff from every Directorate General and all the members or representatives of the Data and Users Committee. Seven external interviews with Spanish institutions, private banking entities and several relevant central banks across multiple continents. A Benchmark survey with the participation of 18 central banks (10 from Eurosystem and 8 out of the scope of to the Eurosystem).
- **Staff engagement.** A survey to all staff with 413 responses, with representation of all Directorates General.
- **Internal documentation.** More than 50 internal documents, including a recent maturity assessment from the Data Office.

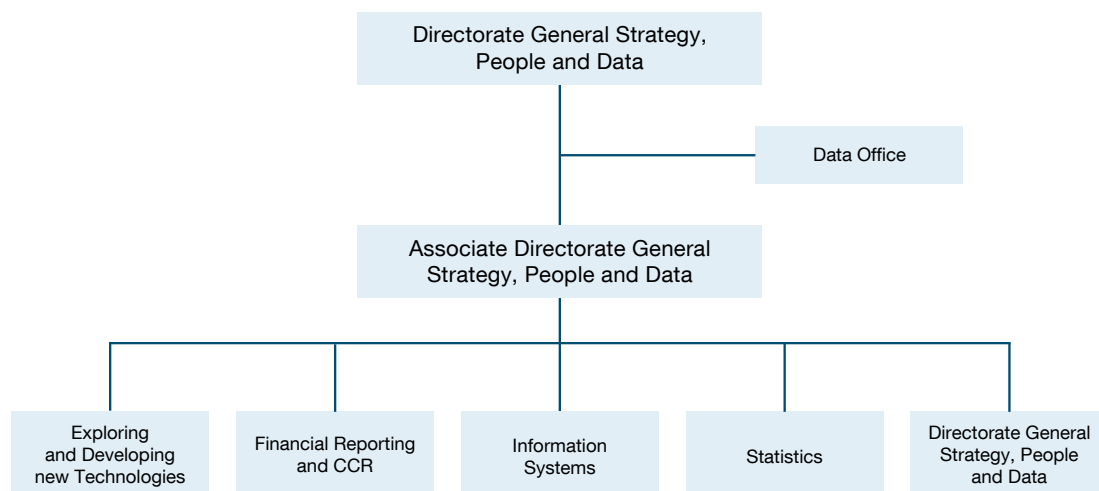
The structure of the report is as follows. Chapter 2 provides a summary of the Banco de España's existing data management framework and ongoing initiatives. Chapter 3 examines the key challenges identified through the evaluation and sets out corresponding recommendations. Chapter 4 outlines the strategic principles that will help to set the foundations for the Banco de España Data Strategy.

2 Data at the Banco de España

The Banco de España included ambitious data goals in its Strategic Plan 2024. The Strategic Plan 2024 already recognised the importance of treating data as a strategic asset and launched several foundational initiatives to strengthen information management. These included initiating the Database Inventory project, designing the Data Lake platform —which has already generated some early wins— and proposing a governance framework.

As a follow through, the Bank initiated some crucial actions to enhance governance and coordination, appointing a CDO and creating the Data Office and the Data and Users Committee. The establishment of the Data Office marked a central component of the Banco de Espana’s shift toward strategic data management. Officially launched on 5 March 2024, it initially reported to the Deputy Governor but became part of a newly created Directorate General for Strategy, People and Data, following a mid-year restructuring. This new structure brings together the institution’s largest data-producing areas with its Information Systems and Strategy and Organisational Change departments, reflecting a clear intent to embed data governance within the heart of organisational strategy.

Figure 1
Organization chart



SOURCE: Banco de España

At the time of the evaluation, the Data Office consists of ten staff members, including the CDO, drawn from different areas of the Bank with strong knowledge of data and institutional operations. It is responsible for leading the Bank’s data strategy and governance.

The Data Office operates under a hybrid data governance model that combines centralised framework —led by the CDO— with decentralised responsibilities distributed

across departments. This structure ensures consistency while encouraging ownership and accountability throughout the organisation.

This work is supported and complemented by the Data and Users Committee, established in November 2024. The committee helps coordinate and guide data efforts by bringing together representatives from the Data Office, statistical and supervisory departments, users, and technology. Composed of executive members with decision-making authority, it operates under its terms of reference and establishes voting structures.

The following table outlines the key functions of the Data office and the Data and User’s Committee.

Table 1:

The Data Office's core functions:	Data and Users Committee' main functions:
<ul style="list-style-type: none"> • Designs and implements the Bank’s data strategy. • Plans and oversees a comprehensive data governance programme. • Promotes a data-driven culture through communication and literacy initiatives. • Collaborates with IT on the definition of data architecture. • Encourages the use of governed analytics. • Coordinates data asset mapping. • Ensures the proper handling of confidential data. 	<ul style="list-style-type: none"> • Establishes ongoing communication between data producers and internal users within the institution. • Monitors current and upcoming data requests, streamlines external data requests, and aligns them with European standards. • Ensures user needs are reflected in data requirements, approves corporate data policies, and validates their implementation. • Coordinates the institution’s positions in international reporting groups to influence harmonisation efforts. • Promotes integrated IT systems and centralised data repositories (“Data Lake”) with access based on user roles and protection levels. • Supports unified data definitions, reports on inter-institutional data agreements, and tracks datasets uploaded to the BELab lab.

Looking ahead, the Bank is taking key steps to modernise its data approach and improve coordination and understanding of data activities across the institution. As part of the Strategic Plan 2030, three major initiatives under the Technology Pillar are expected to accelerate the Bank’s technological and data transformation.

Table 2:

Strategic Plan 2030: Technology Pillar

Initiative “Maximum Value of Information and Data”

The initiative is structured around several workstreams that aim to strengthen data capabilities across the organization. These include coordinating data demand and improving availability, establishing unified data governance through a common data catalogue and master data management, and modernising technological platforms. Additional efforts focus on promoting change management and communication—including the creation of a data portal to support awareness and engagement—as well as enhancing the microdata collection platform by leveraging the European Central Bank’s IReF project. This initiative is working in collaboration with the “Training for the Future” initiative to establish a Data Academy in 2026, featuring tailored learning paths.

Initiative “Cutting-edge Technology: Advanced Infrastructure, Evolution Towards a Hybrid Cloud”

This initiative aims to adopt a hybrid cloud model, which is expected to provide access to more advanced technologies, increase flexibility and efficiency in IT services. The most critical processes and core central banking functions will be primarily hosted in a private cloud, while less critical processes may leverage public cloud services.

Initiative AI – “Boosting innovation and new technologies”

The Bank of Spain aims to become a leader in the application of AI within central banking. This initiative targets to improve efficiency and analytical capabilities with the development of strategic AI projects through a newly established Development and Experimentation Centre on New Technologies. Additionally, the Bank is also expected to enhance generative AI capabilities at the workplace. Lastly, a governance model will be developed to ensure the responsible use of AI. To support this, the Bank will launch an AI Academy in 2025, offering training programmes.

In parallel, the Data Office is developing a new data strategy based on a recent maturity assessment² and is drafting a data management and governance policy. This policy outlines roles and responsibilities and defines key data products —such as data catalogue, business glossary, and metadata.

² The data maturity assessment led by the Data Office, helped by Accenture, in 2025 concludes that there is a lack of corporate view and a poor establishment of data fundamentals, coming from the original situation before the appointment of the CDO and the creation of the Data Office.

Furthermore, the Bank is already initiating actions to foster more collaborative use of data. Efforts such as the Artificial Intelligence and Data Science communities represent a positive step towards encouraging a more open, data-sharing culture within the organisation³.

The Bank also works with external parties on data improvement projects. As a member of the Eurosystem, the Banco de España participates in the Integrated European Reporting Framework (IREF). Additionally, there are other relevant ESCB projects and groups where not only the Data Office, but also other departments from the Bank, participate and are relevant for the Banco de España.

Table 3:

The IReF seeks to simplify statistical reporting from credit institutions by replacing aggregated reports with granular data submissions.

- Its implementation, will require substantial adaptation but offers long-term efficiencies and improved analytical possibilities.
- To adapt to this project, the Bank will develop a local platform to collect microdata from external entities and organizations more efficiently, which will address data collection redundancies.

³ The Data Office is promoting use cases such as Da Vinci project that brings together the Data Office, IT and business areas.

3 Challenges and recommendations

Theme 1: Establish strong data foundations with clear strategies for smarter decisions

Recommendation 1: Promote a bank-wide data strategy

Despite Senior Leadership's ambition to become a data-enabled central bank, progress has been hindered by insufficient vision and funding. Although the new strategic plan and data strategy are expected to address these issues, past efforts have faced significant challenges in both direction and resources.

The Banco de España must promote a comprehensive data strategy. Beyond merely outlining principles, this strategy needs to be aligned with the technology strategy and be backed by a dedicated budget that matches its ambition. It should be a multi-year plan to adapt to the fast-evolving landscape of technology and data and needs to clearly define how data will be handled throughout its lifecycle (collection, storage, use, archive and removal). It must also include a clear roadmap with milestones, appropriate funding and mechanisms for monitoring progress, ensuring accountability, and evaluating outcomes.

The data strategy should cover all data domains within the institution while allowing enough flexibility for operational differences, focusing on “what” needs to be done and “why”, while enabling each area to determine “how” to meet those goals. The Bank should document business area data priorities and include them in the overall data strategy to help build shared ownership and alignment across the organisation. This best practice has been followed by many of the central banks interviewed.

To ensure the data strategy remains effective and relevant, it is essential to engage in regular prioritisation discussions regarding data activities. Having a well-sized budget does not guarantee that all activities can be funded or funded at a specific time. The strategy must remain flexible to accommodate changing business priorities, requiring ongoing dialogue to adjust resource allocation as needed.

Recommendation 2: Develop and implement a comprehensive data governance framework to enable the data strategy

The Bank has historically employed decentralised data governance practices and lacks a data governance framework. Data management responsibilities vary across different departments. Some areas, such as the statistics department, have robust stewardship mechanisms in place, while others lack clearly defined responsibilities. Notably, quality management is not standardised throughout the entire data lifecycle and is managed at the application level. Moreover, there are no indicators or incentives in place to ensure it.

Although efforts are underway to enhance coordination and understanding of data activities across the Bank, as noted in Chapter 2, the Data Office is not fully assuming its intended role. Although its formal functions reflect best practices, certain activities remain outside the tasks it effectively performs. Moreover, the organisation often perceives the Data Office as just another department, rather than recognising its cross-cutting mandate.

Strong, consistent, and visible senior leadership is essential for the success of the Data Office and for the effectiveness of the Chief Data Officer role. To fully realise its potential, the Data Office must be further empowered to centralise and coordinate effectively its defined function to avoid the persistence of siloed data activities. The Data Office must have the recognised authority to lead the definition of data access procedures, manage data demand, and design supportive tools for data governance and change management. Strong executive sponsorship is essential —not only to reinforce the role of the Chief Data Officer, but also to signal that improving data use is a shared responsibility across the organisation.

The Data and Users Committee functions and actions will need to be enhanced. The current remit combines advisory roles with limited approval responsibilities. In conversations with other central banks, similar data committees often take on broader responsibilities, such as ensuring that the data strategy is clearly communicated, well understood, and effectively implemented across the organisation.

This committee could be supported by formal groups of staff from different business areas with similar responsibilities. These groups, composed of roles such as data stewards or users, will be responsible for overseeing governance, quality, and day-to-day data management, while also serving as a forum to discuss common challenges and escalate issues to the Data Committee when necessary. This approach has been adopted by a peer institution, which established a Data Steward Group to support the Data Committee and consequently aligned business areas on operational data management matters.

The Bank must establish a comprehensive data governance framework to support the data strategy mentioned previously. This framework should clearly define data roles and responsibilities and include essential elements such as data catalogue, data quality management program, and a well-defined scope for governance activities⁴. It should also consider the processes to manage shared resources like metadata or reference and master data⁵.

⁴ Some central banks consider the usage phase of the data lifecycle to fall outside the scope of data governance and instead apply separate governance frameworks —particularly for AI. Others, however, include certain types of analytical outputs within the scope of their data governance policies. As mentioned in Chapter 2, an AI governance framework is being developed alongside data governance. Coordinating both will be essential, as AI efforts depend on high-quality data.

⁵ “Metadata” is “data about data” (details like where data came from, when it was collected, and what it means); “Reference and master data” are shared lists used across the organization (lists of countries, currencies, departments, or customer IDs). If these aren’t consistent, different teams might use different values, causing errors. Since no single area fully owns these shared resources, the Data Office should manage them centrally, ensure consistency, and make them easy to use.



Theme 2: Provide for technology capabilities and innovation suitable for data ambitions

Recommendation 3: Align the technology and data strategies

Alongside culture, the technology capabilities and strategy are critical enablers for any organisation's data strategy. The technology strategy needs to focus on delivering the data capabilities and requirements across the institution.

Table 4:

A recent assessment of the technology assets has identified significant issues holding back the Banco de España today, and from future plans, including data enablement:

- One of the most significant challenges the organisation faces is the burden of a large legacy of IT assets. The Banco de España is encumbered by a complex system that consumes a significant portion of the IT budget, on maintenance and operation, rather than fostering innovation or investing in new capabilities.
- Another major issue is the inadequate investment in enabling technology. Employees are constrained by outdated and underpowered IT systems, such as legacy desktops that follow a six-year refresh cycle. These obsolete technologies hinder the Bank's ability to leverage advanced tools like cloud computing and artificial intelligence.

Technology has also been identified as a critical gap and enabler in previous external evaluations. From the seven evaluations already undertaken by the OIE, five of them recommend addressing IT issues (Dissemination, Research, SupTech, Macroeconomic projections and Conduct Supervision).

The lack of a bank-wide architectural overview suggests that IT decisions are often made in silos, focusing on individual applications rather than adopting a holistic, enterprise-wide approach. This absence of a unified vision for IT hinders the implementation of a consistent and efficient technology strategy across the institution.

Furthermore, the Banco de España's fragmented application-driven framework relies heavily on documentation, instead of having rules and controls built into the systems. This makes it harder to keep protocols and safeguards consistent and secure across the organisation.

The ongoing development of the Data Lake has shown promise but is lacking a defined strategy. While there have been tangible benefits in enabling users to access shared data,

the lack of clear guidelines on which datasets should move to the lake and how they will be managed, leave the initiative vulnerable to inefficiencies and data inconsistencies. Questions regarding the Data Lake's role as the "golden source" of data or as a mere reporting hub remain unanswered, contributing to uncertainty about its future scalability.

To address these challenges, it is crucial that the Bank develops the comprehensive multi-year IT strategy that aligns with both data management goals and business priorities. A decision on the cloud strategy is essential —whether to augment existing systems with cloud technology or to fully transition to cloud-based systems, which other central banks have chosen to do⁶. It should be driven by the design of the end-to-end data lifecycle and by prioritising feasible application migrations. Building cloud infrastructure, private and public, without these requirements creates risk of increasing costs without necessary delivering functionality, cost or data sharing benefits.

The IT strategy must also detail a budgeted roadmap for replacing legacy systems, outlining specific timelines for their decommissioning and substitution. To achieve this, the Bank should factor in cloud storage and compute costs to ensure future investments support long-term savings. Many of these issues are expected to be approached under the Technology pillar of the new strategic plan. However, based on the interviews, it appears that there are currently no formal plans to define a comprehensive legacy strategy, and decommissioning efforts may instead be approached on a case-by-case basis.

As part of the IT strategy, the Bank should prioritise the development of a unified Data Lake strategy and plan, defining the target datasets⁷. The Data Lake's role should be clarified —whether it will serve as the central repository for all data or simply as a hub for reporting and data exchange. As a requirement for the implementation of the Data Lake, the Bank should first define a bank-wide data model supported by a new data catalogue that provides a clear inventory of all data assets.

⁶ An interviewed peer central bank has initiated a three-year plan to replace its legacy systems with a single enterprise data platform on the cloud, focusing on statistics and macroeconomic forecasting. This plan aims to enhance data access, reduce duplication, improve supervision efficiency, lower external data costs, and enable greater analytical innovation, including AI. By integrating data and technology strategies, this peer is moving from siloed applications to enterprise-wide business processes, facilitating better data sharing and maximising value.

⁷ A "dataset" is an organized collection of related data that is stored and managed together. It can include tables, files, or any type of structured information used for analysis, reporting, or processing.

The Banco de España must embed data governance, quality, and security practices directly into systems rather than in physical documentation. More automated capabilities for data governance and management would ensure timeliness of updates, better accuracy, and consistency of data and improved transparency and accountability across the IT assets.

Recommendation 4: Invest to modernise technology and remove outdated systems

The cost associated with implementing new technologies, such as migration to the cloud, is one of the major obstacles central banks face. Several banks have had to support dual operational costs, maintaining both legacy and new systems, in their transition to the cloud. In these cases, operational efficiencies only materialise once the new systems are fully operational, and the old ones can be retired. According to one of the interviewed central banks, this transition would take a minimum of one year.

Additionally, the centralised IT budget, while providing some organisational advantages, presents challenges in terms of fostering ownership and accountability across individual business units. Currently, all expenses related to technology and data projects are assigned to the IT department, while business areas are unaware of the costs associated with their requests.

An essential component of the Bank's transformation will involve increasing overall investment in IT, as under investment for previous years is evident and has reached a critical stage. Specifically, the Bank should prioritise funding for the removal and replacement of legacy systems, upgrade internal IT infrastructure, and accelerate the adoption of cloud-based technologies, analytic tools, and advanced capabilities such as AI. This investment will reduce ongoing legacy maintenance costs, enabling the reallocation of funds to more innovative projects that can drive growth and efficiency.

As part of the shift to cloud technologies, the Bank should reassess its cost allocation approach to reflect the on-demand nature of cloud services. As institutions migrate to cloud-based services and providers, their investment profile change. They shift from having to invest capital into their own in-house software and hardware systems to effectively paying for computing and data as a service. In this way, the capital expenditure is reduced and replaced by operational expenditure and total spending becomes more variable. This shift could offer greater flexibility to the Bank on how IT costs are distributed and managed across the organisation. The Strategic Plan 2030 enhances cost transparency —enabling business units to understand application and data costs, though without allocating them. An additional step forward would be to allocate portions of the IT budget to individual business areas, fostering a sense of ownership

and accountability. This decentralised approach might help break down silos, promote cross-departmental collaboration, and create a more agile, results-driven environment. This approach is also used by other central banks.

The Bank must invest in IT workforce at both leadership and staff levels, while also leveraging best-in-class external expertise. The institution is already starting to hire new key talent, to reduce reliance on third party outsourced vendors. Whilst this continues, it will also need to recognise the need to recruit experience in cloud-based architectures, Data Lake and data governance systems.

Theme 3: Ensure employees embody top talent to drive data excellence

Recommendation 5: Revise the data skill framework

The way data skills are represented in job postings and job descriptions across the Bank presents a significant challenge. Currently, there is a notable gap in how data literacy is integrated into job roles. Many job postings fail to include necessary data-related competencies, leaving roles that are critical for the Bank's data transformation journey underrepresented. The absence of internal job descriptions also exacerbates the issue, creating confusion about the skill sets required for roles that involve handling data. Addressing this gap is essential for attracting and retaining the necessary talent.

To tackle the difficulties of accurately representing data literacy within job roles, the Banco de España should identify the specific data skills required across various functions. This would include both current and future roles, ensuring that any position involving data is clearly defined with the relevant competencies. The Bank job descriptions need to reflect the growing importance of data skills, incorporating explicit references to technical and analytical capabilities where appropriate —even those positions that may have previously shared the same job description⁸.

Recommendation 6: Build a long-term training plan to close the gap in data skills across the organisation

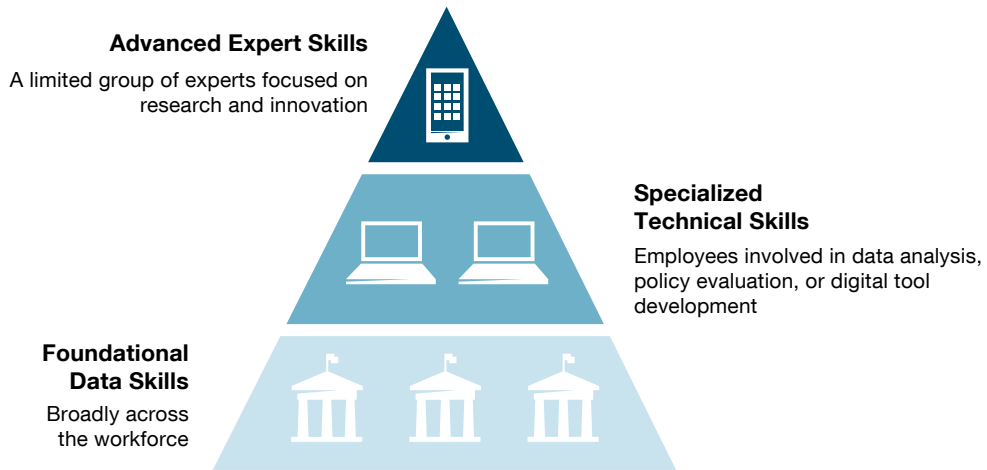
To become data-driven, the Bank must place greater emphasis on internal data training. Over the past two years, it has offered internal training mainly focused on highly technical subjects such as programming languages (e.g., basic Python, R) and data science. Nonetheless, training has largely followed a reactive model, initiated upon employee request, and lacks assessment of its impact on job performance. These gaps make it difficult to assess whether the learning initiatives are effectively contributing to capability development and organisational goals. According to an internal survey, only 45% of the employees felt they had received sufficient training in data-related tasks effectively.

In the current environment, it is difficult not to be captivated by the transformative potential of data analytics and AI, which are reshaping industries and institutions around the world. For central banks like the Banco de España, the promise of these technologies is both exciting and essential. However, the excitement must be matched by a credible, structured, and realistic plan to close the gap in data skills across the organisation. Without such a plan, the benefits of these technologies may remain out of reach.

⁸ Two positions that were once functionally identical may now demand significantly different levels of data expertise due to the evolving role of data in decision-making and operations.

To correctly design a data training plan, the Bank should visualise data skills as the pyramid represented below. At the base, there are widely needed abilities, such as data literacy. As one moves up, more specialised skills, such as programming and machine learning, are needed by fewer roles. At the top, there are advanced capabilities, such as AI research and large-scale data engineering, essential for a small group of experts.

Figure 2
A Structured Framework for Data Skills in the Bank



SOURCE: Banco de España

The Bank should adopt a balanced and tiered training approach that supports excellence at the frontier, while ensuring a strong foundation is in place. To foster widespread data fluency, the Bank should design internal training programs to upskill employees while creating clear progression paths toward more advanced competencies. Foundational skills must be prioritised first, such competencies are essential for fostering a data-informed culture and should be part of the standard skill set for a large portion of the Banco de España’s staff. The Bank also needs to explicitly link training modules and certifications to the specific data competencies required for advancement as explained in Recommendation 5. Currently, many employees struggle to identify the skills needed for career growth, so mapping competencies to roles and connecting them with relevant training will bridge this gap. The Data and AI academies are good steps on this direction; however, the former should be developed either prior to or, at least, parallel with the later.

Recommendation 7: Develop a forward-looking data talent strategy for hiring and nurturing data talent

The Banco de España is working to establish itself as an attractive workplace for data talent. In this regard, the Banco de España is creating an Innovation Centre in Barcelona, following a recent partnership with the Barcelona Supercomputing Centre. This centre aims to become a hub for attracting talent in data exploitation and AI, particularly targeting data scientists and AI experts. Here, they can leverage the computing capabilities of the Barcelona Supercomputing Centre and exchange knowledge and experience with other data professionals.

However, attracting and retaining top talent in data-intensive roles is an extraordinarily difficult challenge –not only for the Banco de España, but globally. The high demand for data expertise across industries, combined with rapid technological change, has made data professionals one of the most competitive labour market segments. While addressing this issue in depth lies beyond the scope of the present evaluation, it is critical to highlight that hiring and developing data talent requires a distinct and forward-looking strategy.

The lack of clarity around data skills in job descriptions, as mentioned in Recommendation 5, makes it even more difficult to attract and retain talent as it results in misaligned compensation. In response, organisations emphasise internal training –which, while beneficial for Spain and the Banco de España, may still result in higher attrition if salaries don't reflect market rates. In short, unclear role definitions lead to incorrect pay, difficulties in hiring, reliance on internal upskilling, and ultimately, a higher risk of losing skilled employees. Breaking this cycle requires properly recognising and valuing specialised data skills in the most critical roles.

Rather than limiting internships to final-year university students, the Banco de España needs to consider beginning internships earlier in the educational pipeline— ideally after students have completed foundational coursework in programming, systems design, or data science. Offering a sequence of summer internships over multiple years provides mutual benefits: the Bank may gain early access to emerging talent and fresh ideas, while students gain exposure to the real-world application of their knowledge. Additionally, by rotating interns across different departments, they may develop an integrated understanding of the Bank's functions. This holistic view of data needs in the Bank starts with the new hires.

The Banco de España could adopt a structured data talent rotation program for employees with advanced data skills. Large institutions across the public and private sectors have successfully implemented rotation programs for high-potential talent. Rotations would ideally span a range of environments –functional areas, client-facing roles, and technical teams. The aim is to foster cross-functional collaboration, develop shared language and culture around data, and ensure that technically skilled professionals understand the full institutional context of their work.

The Bank should continue to host internal hackathons and launch other data-centric projects with external collaboration. These events bring together multidisciplinary teams across departments and skill sets, and where appropriate, include external experts or mentors. In addition to promoting creative problem-solving and innovation, hackathons build community and deepen employees' understanding of how their work fits into the broader mission of the Bank.

For all these strategies to be effective, it is absolutely crucial to ensure institutional time and structure to support them. These activities –training, knowledge-sharing, innovation, and collaboration– should not be treated as extracurricular or secondary to routine tasks. Instead, they must be explicitly integrated into job descriptions and workload planning. A data-driven or AI-enabled organisation requires more than just technical infrastructure –it requires the time and space for its workforce to grow and adapt alongside technology. Job roles should clearly define learning and innovation time as part of an employee's core responsibilities.

Acknowledging that adopting industry rates represents a challenge due to legal constraints the Bank could develop creative alternative schemes of compensation. Without competitive compensation that reflects market rates for data-intensive roles, the Bank may struggle to attract and retain top talent. Defining data-centric roles is just the beginning –those definitions must translate into labour market outcomes that reward expertise appropriately.



Theme 4: Create and celebrate a transformed culture from risk averse silos to data-driven collaboration

A modern best practice sees culture as the result of people responding to incentives, expectations, and commitments around them. Culture is shaped by coordination and reflects individuals' best responses based on their expectations of others' actions. It is driven more by informal incentives and shared understandings than by formal rules.

In the context of data transformations, cultural change is essential and requires real investment. Employees must be given time to upskill, share knowledge, and coordinate across departments. Breaking down data silos should be seen as contributing to high performance, not as a distraction. Transforming culture demands thoughtful design of incentives and visible, credible commitments of time and resources to foster shared expectations that make cultural change possible and sustainable.

Recommendation 8: Improve day to day data communication and collaboration within the Bank

There is a clear lack of internal collaboration within the Bank when it comes to data sharing, because of insufficient communication between departments. Employees primarily work within their own areas and applications, leading to limited awareness of what other areas are doing. Each department tends to focus solely on its own mission, often without considering how its data practices might benefit other areas. Moreover, collaboration tends to occur on a personal level rather than through established, organisation-wide processes.

Table 5:

In the recent internal survey, staff reported a relatively positive perception of data use within their own areas but showed limited awareness of external data sources that could enhance their work.

- Besides, 97% of the employees from this survey believes a good data governance is very important for the Banco de España.
- Yet only 7% is fully aware and completely understands the functions of the Data Office.

Additionally, the poor information in the intranet makes it difficult for employees to locate necessary data or gain insights into the activities of other departments. During the internal interviews, it was found that some employees were unaware of the existence of the Data Lake, even though all the information is supposedly available on the intranet.

Moreover, the Banco de España's risk-averse culture and strong sense of data ownership among employees significantly limit data sharing. During the interviews, employees expressed reluctance to share data due to confidentiality concerns and fear of exposing errors or facing criticism. Besides, some of them perceive the data they handle and the analyses they produce as their personal property, which discourages them from sharing their work with others.

The Bank should consider enhancing internal communication and promoting data-driven work, by improving the availability, organisation and accessibility of information on its intranet. While targeted communications like emails deliver timely updates, they reach a limited audience. A clear, user-friendly intranet —anchored by a future Data Portal, as mentioned in Chapter 2— would centralise critical information on data initiatives, policies, and strategic developments, helping employees stay informed and aligned. This platform would support both push communication and pull communication ensuring diverse communication preferences are met. Ongoing evaluation and optimisation would maintain its relevance and usability.

It is essential to break down silos to build a collaborative data culture. Cross-organisation groups such as data communities offer significant benefits. The Bank should promote the mindset of “ask before you do”, encouraging employees to consult with other areas when planning new data initiatives. One way to foster this is through the creation of communities of practice⁹ that bring together employees from diverse areas to discuss data challenges, and sharing insights can help bridge the gap between isolated functions. This inclusive approach would not only enhance data literacy across the Bank, but also foster a culture of openness, build broader networks across departments, and promote innovative problem-solving by leveraging collective expertise. As detailed in Chapter 2, the Bank is already enhancing internal data collaboration by leveraging the expertise of the Artificial Intelligence and Data Science communities.

At the same time, the Bank should reframe discussions around data as a shared organisational asset, rather than the sole property of individual departments to foster a sense of collective responsibility. To facilitate this shift, the Bank is considering eliminating terms such as “data owner” from its internal vocabulary, replacing it with “data sponsor”, as the former can imply unnecessary control and hinder collaboration.

Clear policies must balance strong data protection with appropriate sharing to reduce silos. These policies should also support reasonable risk-taking, encouraging employees to share their analyses confidently and treat mistakes as opportunities to learn.

⁹ These communities serve a distinct purpose and should not be mistaken for the formal groups outlined in Recommendation 2. While these groups focus on the governance, quality, and management of data, the communities are informal groups focused on collaboration, knowledge sharing, and culture across broader data-related topics.

Recommendation 9: Focus on improvement, not perfection

The Banco de España's cultural emphasis on perfection over progress can stifle innovation on data activities. This is evident in decision making. This cautious approach not only slows the adoption of modern practices, but also risks obsolescence, as data and technology evolve faster than the Bank's ability to implement changes.

The current environment does not actively encourage experimentation with data. Employees often feel that output must be flawless before being shared, leading to a reluctance to try new approaches. This mindset is particularly problematic given the rapid pace of change in data and technology; by the time a process is perfected, it may already be outdated. Additionally, the absence of structured environments for testing new ideas means that opportunities for creative problem-solving are limited.

Promoting a mindset that values improvement over perfection would foster a more dynamic and innovative data culture at the institution. By building a culture where mistakes are acceptable —as long as they lead to learning— the Bank can reduce the fear of failure that currently hinders innovation. Regular communication from management about this shift in perspective will reinforce a more open and creative working environment. To support this cultural change, the Banco de España should encourage staff to experiment in a controlled manner —such as through sandbox environments and activities like the recommended hackathons— to allow them to explore new ideas without fear of failure. If the expected benefits of an initiative outweigh the risks, the Bank should support it. This would help build a culture where experimentation is encouraged and where failure is seen as a learning opportunity.

One effective practice is focusing on incremental progress by adopting the 80/20 rule or Pareto principle —improving things for one person without making anyone worse off. By aiming for practical, broad-based enhancements rather than perfection, the Bank can make meaningful progress without being hindered by unattainable standards.

Recommendation 10: Add a horizontal view to a simplified organisational structure

The Banco de España has a highly complex structure, characterised by a large number of small teams and many managerial layers. This type of structure fosters siloed communication, where managers and their small teams tend to work closely but isolated from other areas. As a result, it hampers cooperation between areas, as employees often feel they need to seek approval from multiple levels before sharing information. This perception discourages data sharing and collaboration.

However, while this evaluation is still in progress, the Banco de España has approved an organisational change to improve agility, flexibility and cross-functional ways of working. This aims to help the Bank respond better to complex and evolving challenges. A new matrix structure combines hierarchical and functional reporting lines, encouraging collaboration and synergies across departments. In some areas, traditional unit-based models are being replaced by more flexible, project-oriented teams. The changes also promote staff mobility, allowing employees to gain broader experience and take on new challenges, ultimately supporting a more agile, cross-functional institution.

This organisational change supports the new strategic plan, marking a key step toward overcoming cultural barriers and becoming data-driven. In our discussions with other central banks, transforming organisational culture consistently emerged as a cornerstone of success. Many CDO's stressed that, without cultural change, technological advancements alone are insufficient – “culture eats technology for breakfast,” as one CDO aptly put it. Therefore, proactively addressing cultural obstacles to data sharing is key to achieving long-term success.

The Banco de España must acknowledge and address the challenges presented by its highly complex structure. If team sizes are larger, managers would be able to offer more targeted mentoring, foster team cohesion, and better align daily data activities with strategic objectives. Optimising managerial structures would enhance oversight and could make change initiatives more manageable. We recommend this is picked up as part of a culture and organisation review.

The formation of cross-functional work teams will foster a shared understanding of data. While this approach is already being promoted under the new Strategic Plan 2030, it remains pivotal to deepen these efforts. Incentives should be established to encourage participation, and the outcomes of collaborative efforts should be regularly evaluated, considering both the results achieved and the employee satisfaction generated through teamwork.

A dedicated transformation office would support data transformation efforts and act as a central hub for guiding and coordinating change initiatives. It would offer expertise and resources to business units that may lack the capacity to implement changes on their own. The Bank could benefit from institutionalising change management practices to ensure consistent support and reduce resistance to new practices.

4 The Banco de España's strategic data principles

Making major improvements and changes to data foundations, technology, talent and culture requires not just resources and planning. It will also require a shared vision of what things will be like after the work is complete. Because there are many recommendations with multiple moving parts, it can be difficult to keep track of all the details for every undertaking. Having some high-level strategic principles for data can help provide general guidance for situations that are not specifically covered by the recommendations, as well as instances where there may be differences in opinion about how to best achieve a particular goal.

These principles are meant to provide a "North Star" for the work being done, to address the issues raised in this report. Adopting these principles helps provide some general guidance for the direction of travel; like the North Star, they help point to a particular direction without giving detailed directions on how to get there. When in doubt as to how to proceed, following these principles will help ensure the direction chosen is not in conflict with the recommendations made.

1. **Data are a strategic asset of the Banco de España and should be treated as such.** This requires adopting a holistic approach that includes a clear understanding of where data are stored, how they are organised and maintaining a comprehensive Bank-wide view. As with other critical assets, to maximise its value, data management must involve the right talent, the appropriate investment, and a commitment to effective execution. Clear accountability should be established to ensure that strategies are implemented successfully, at both individual and group levels, supported by regular progress reviews to ensure effective implementation and continuous improvement.
2. **Data should be made available to as broad a userbase as possible, subject to legal and privacy constraints, to maximise their value to the Banco de España and to society.** Security and privacy concerns are real and important and should not be overlooked, but too often they are not real issues that would prevent data sharing. Changing the mindset from "need to know" to "need to restrict" will allow much broader use of data to provide maximum benefit.
3. **Perfect is the enemy of good.** While aiming for the highest achievement is a laudable goal, it is often not necessary, and sometimes not possible in the fast-changing world of data. Undertaking efforts that are good, if not perfect, allows more work to be done faster and is likely to solve most issues even if it doesn't address all of them.
4. **Ask before you do.** Increasing collaboration helps break down silos and avoid unnecessary expenditures. Build a culture of asking others across the Banco de España for input, suggestions, or existing solutions, before proceeding to undertake an action.

5. **Technology alone will never solve a business process problem but can inhibit the solution.** Purchasing a platform or software will not fix an inefficient procedure, nor will it create an effective process where one does not exist.

6. **There should be one authoritative copy of data, known as the “golden copy”.** While it is not practical to eliminate all data copies, there should be a clearly identified primary copy to avoid duplication errors. This authoritative copy ensures consistency and accuracy, reducing the risk of errors that arise when multiple, conflicting versions exist. Additionally, external data should be requested only once, to minimise redundancy and maintain clarity in data management.