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# The new frontiers of data lineage in banking

Moving from regulatory compliance to business value creation

2026

MAKING AN IMPACT THAT MATTERS since 1845

*“The way banks are expected to approach data lineage today is hardly sustainable. Exhaustive documentation leads to huge costs, delivers marginal business value, and distracts from what matters: understanding and controlling their data to get timely and trusted information’s to steer your bank.”*

# Contents

Introduction 4

Key messages 5

From principle to prescription 7

The gap between expectations and execution 8

Risk-based approaches to compliance 9

Levers to bridge regulatory intent and operational reality 11

Reaping the benefits of data lineage 17

From today's constraints to tomorrow's capabilities 18

Conclusion 20

Contacts 21

# Introduction

## Introduction

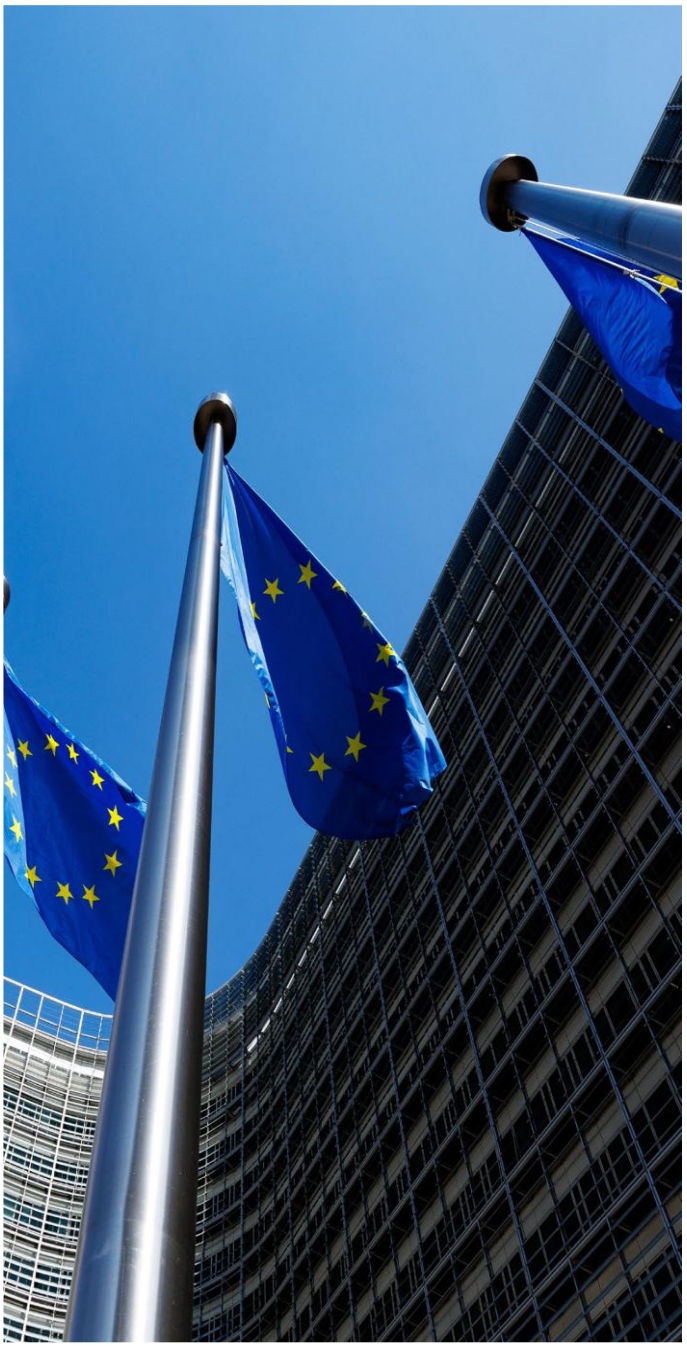
With the publication of the Guide on effective risk data aggregation and risk reporting (RDARR Guide) in 2024 by the European Central Bank (ECB), regulators set out specific data lineage requirements, catching many banks off guard with perceived heightened standards that require complete, attribute-level data lineage across the entire data landscape. As a result, supervisory findings have increased and banks have invested significantly in integrated data management, including data lineage documentation, both in implementation and remediation projects.

Despite ongoing investments in people, processes and technologies, 77% banks indicate that the costs required to meet regulatory expectations on data lineage remain significant. They struggle to justify multi-million programmes that are at risk of becoming obsolete upon completion and that deliver limited business value. Banks find themselves torn between regulatory compliance and business value, with data lineage budgets competing against data modernisation initiatives.

## What got us here?

Based on our experience with risk data aggregation and risk reporting (RDARR) and data lineage initiatives, we have observed a variety of implementation strategies, each presenting distinct advantages and disadvantages. Four key levers have emerged that influence how banks pursue data lineage: scope of application, granularity, end-to-end coverage and execution. Approaches vary according to each bank's regulatory risk tolerance and business risk appetite.

Looking forward, AI-driven solutions, emerging technologies and modern system architectures are poised to transform data lineage management. AI-driven solutions promise to progressively automate substantial portions of data lineage discovery, documentation and upkeep, leading to a notable reduction in the manual effort required for maintenance. Furthermore, new systems and data platforms increasingly feature native technical data lineage capabilities embedded within their metadata frameworks, eliminating the need for manual creation. In this environment, technical data lineage will be generated and maintained automatically as a standard component of system functionality. Nonetheless, it remains necessary to incorporate business context for a comprehensive understanding.



1 - Deloitte BCBS 239 Roundtable 16-Sep-2025

# Key message

## Pragmatism over perfection

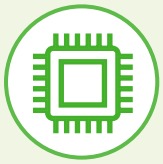
**Regulators expect banks to manage key data flows, apply sound data quality controls, and maintain transparency. Not to build data lineage for lineage's sake. Banks that understand this intent comply more efficiently**

## Regulatory risk tolerance shapes strategy

**There is no universal approach. Banks tailor their data lineage approach to match their regulatory risk tolerance and business risk appetite, aiming to balance compliance with operational feasibility and business value**

## Operational levers determine scope, cost and defensibility

**Scope definition, granularity calibration, critical data element (CDE) selection, and entity coverage are the key levers that determine both the cost of implementation and the strength of the regulatory argument**



## From compliance to competitive advantage

**Banks that align the data lineage programme with data modernisation and enablement of delivering automation, including via emerging AI capabilities, turn a regulatory obligation into an operational asset**

## Think beyond remediation

**Banks that invest in sustainable, technology-driven technical data lineage approaches rather than manual documentation factories reduce long-term cost while building infrastructure that delivers value beyond compliance**

# From principle to prescription

### BCBS 239 principles

Since the publication of the Basel Committee on Banking Supervision (BCBS) 239 principles in 2013, the ECB has made governance and risk data quality management a supervisory priority. When global systemically important banks (G-SIBs) faced an initial BCBS 239 implementation deadline in 2016, the ECB conducted a thematic review focused on effective risk data aggregation and reporting (RDARR). This review assessed banks' overall data governance, aggregation capabilities, and reporting practices. Unsatisfied with the findings, the ECB then required banks to submit annual progress reports detailing their BCBS 239 implementation efforts and results.

### Publication of RDARR Guide by ECB

Many banks failed to meet supervisory expectations during 2021–22 on-site inspections, prompting the ECB to release the RDARR Guide in May 2024 for clearer supervisory expectations. Unlike the broad BCBS 239 principles, the RDARR Guide clarifies scope and requirements, giving banks a precise understanding of what the ECB expects.

Although essential for meeting the requirements of BCBS 239, it is worth noting that 'data lineage' is not mentioned once in the original publication. This changed with the publication of the RDARR Guide. The requirement in section 3.4 asks specifically for 'complete and up-to-date data lineages on data attribute level (starting from data capture and including extraction, transformation and loading) for the risk indicators, and their critical data elements [...]'.

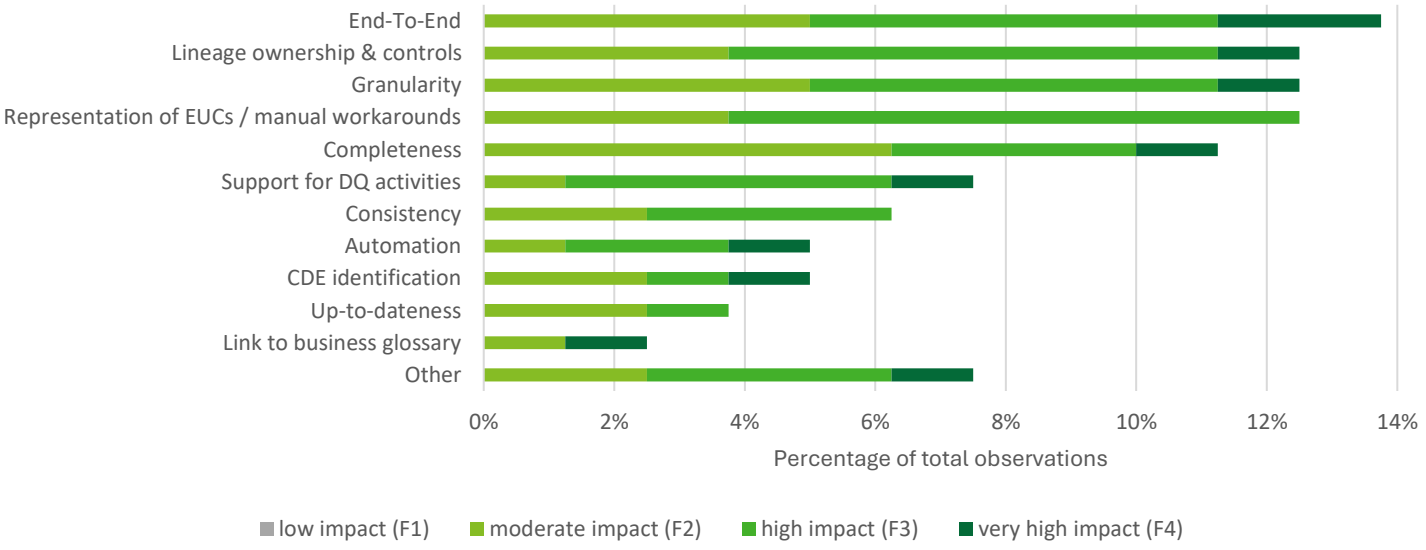
The fundamental reason behind this clarification is straightforward: Regulators want banks to deliver reliable, explainable, and evidenced risk data so that management and supervisors can make decisions they trust, both during normal periods and in circumstances of stress or crisis. Data lineage is the instrument through which banks demonstrate that this trust is warranted.

Now, banks are expected to trace and document how every piece of critical risk data moves through their systems, from origination to final reporting output, at attribute level. Together, these regulatory developments raised the bar for transparency, controllability, and auditability of data flows and place renewed pressure on banks to demonstrate, at any time, how their key risk indicators (KRI) were produced, thus enhancing the level of confidence on their correctness, completeness and timeliness.

### Our benchmark analysis

This intensified scrutiny is already visible in practice. Our benchmark analysis of data lineage findings across a representative selection of supervised banks shows that end-to-end data lineage, data lineage ownership and controls, and granularity consistently account for the largest share of supervisory observations, followed closely by the representation of End User Computing (EUC) and manual workarounds. Completeness, data quality support, and consistency form a second tier, while automation, CDE identification, and how up-to-date information is, appear less frequently but remain on the supervisory radar (Figure 1).

**Fig. 1 - Benchmark analysis of data lineage findings**



# The gap between expectations and execution

Despite increased regulatory attention and the clarification of expectations in the RDARR Guide, many banks still fall short of supervisory expectations for data lineage. Persistent problems such as data lineage being too high level or insufficient coverage of Key Risk Indicators (KRIs) and reports have been repeatedly highlighted by ECB assessments, yet industry progress remains inconsistent.

### Deloitte BCBS 239 roundtable

Banks share this viewpoint. At a recent Deloitte BCBS 239 roundtable, participants identified the data lineage categories needing the most practical remediation solutions. The results were clear: end-to-end data lineage and granularity stood out as top concerns, followed by how EUCs and manual workarounds are represented. Other categories were ranked much lower, which matches findings from the benchmark analysis of data lineage findings in Figure 2.

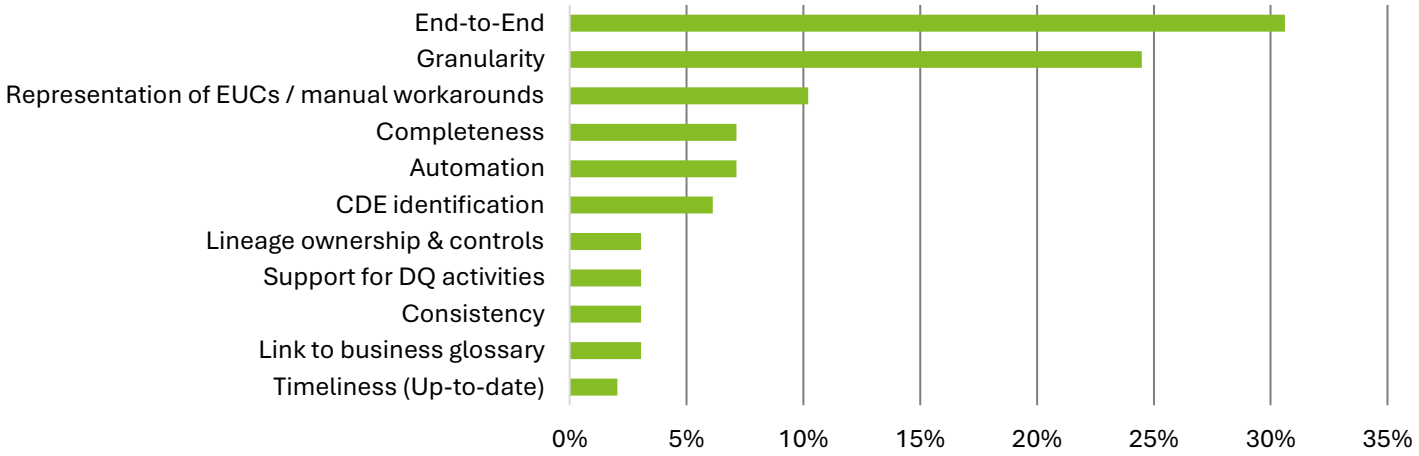
The pattern is evident. Categories that score highest in the roundtable results are precisely those where supervisory expectations and operational reality diverge most sharply. Banks are not struggling with the concept of data lineage or with defining ownership. They are struggling with the sheer scope and depth of what is being asked of them, particularly when it comes to achieving true end-to-end traceability at the granularity level the RDARR Guide describes.

The challenge is compounded by a tension located at the heart of every data lineage programme: compliance with granular end-to-end data lineage expectations is costly and often yields limited perceived business value. At the same time, value-generating modernisation efforts compete for the same resources and budgets. Banks find themselves caught between two legitimate priorities: regulatory defensibility on one side and operational return on investment on the other. Striking the right balance between the two is not a one-off decision but a persistent strategic challenge.

How deeply this tension is felt varies considerably across institutions and, importantly, across jurisdictions. The European banking landscape is far from homogeneous when it comes to data lineage maturity and regulatory pressure. Banks headquartered in a single EU jurisdiction and directly supervised by the ECB face a different set of challenges than institutions operating across multiple jurisdictions or those with a parent company outside the Eurozone or Europe. Justifying data lineage budgets to a non-European head office, which lacks similar supervisory pressures, is complex. Securing approval from the head office in a US-bank or Asian bank for a costly ECB-driven programme poses both financial and internal political challenges.

Nevertheless, the reality is that there is no perfect solution or established standard yet. No bank has fully cracked the code on how to implement data lineage in a way that is simultaneously comprehensive, cost-efficient, and business value generating. What is observable across the industry, however, is a spectrum of approaches and levers with distinct trade-offs that banks can tweak and adjust whilst remaining within their risk appetite.

**Fig. 2 - Which lineage finding categories do you believe require a more pragmatic approach to remediation?**



# Risk-based approaches to compliance

### RDARR Guide application

Within the market, we see different approaches to data lineage, depending on how banks interpret compliance with regulatory expectations and the importance they place on generating business value.

The question is not whether to comply with regulatory expectations, but how to balance strict adherence to regulatory provisions, operational feasibility and business value. Some banks follow the BCBS 239 principles and RDARR Guide letter by letter. They prioritise, or even overemphasise, data lineage from a compliance perspective, with limited differentiation to varying levels of underlying data aggregation risk or business value. The reward is straightforward: minimal exposure to supervisory findings. The price, however, is steep. Implementation costs and resource demands remain consistently high during the initial documentation and throughout ongoing maintenance. The uncomfortable truth is that when asked to demonstrate the resulting business value, the outcomes do not justify the investment.

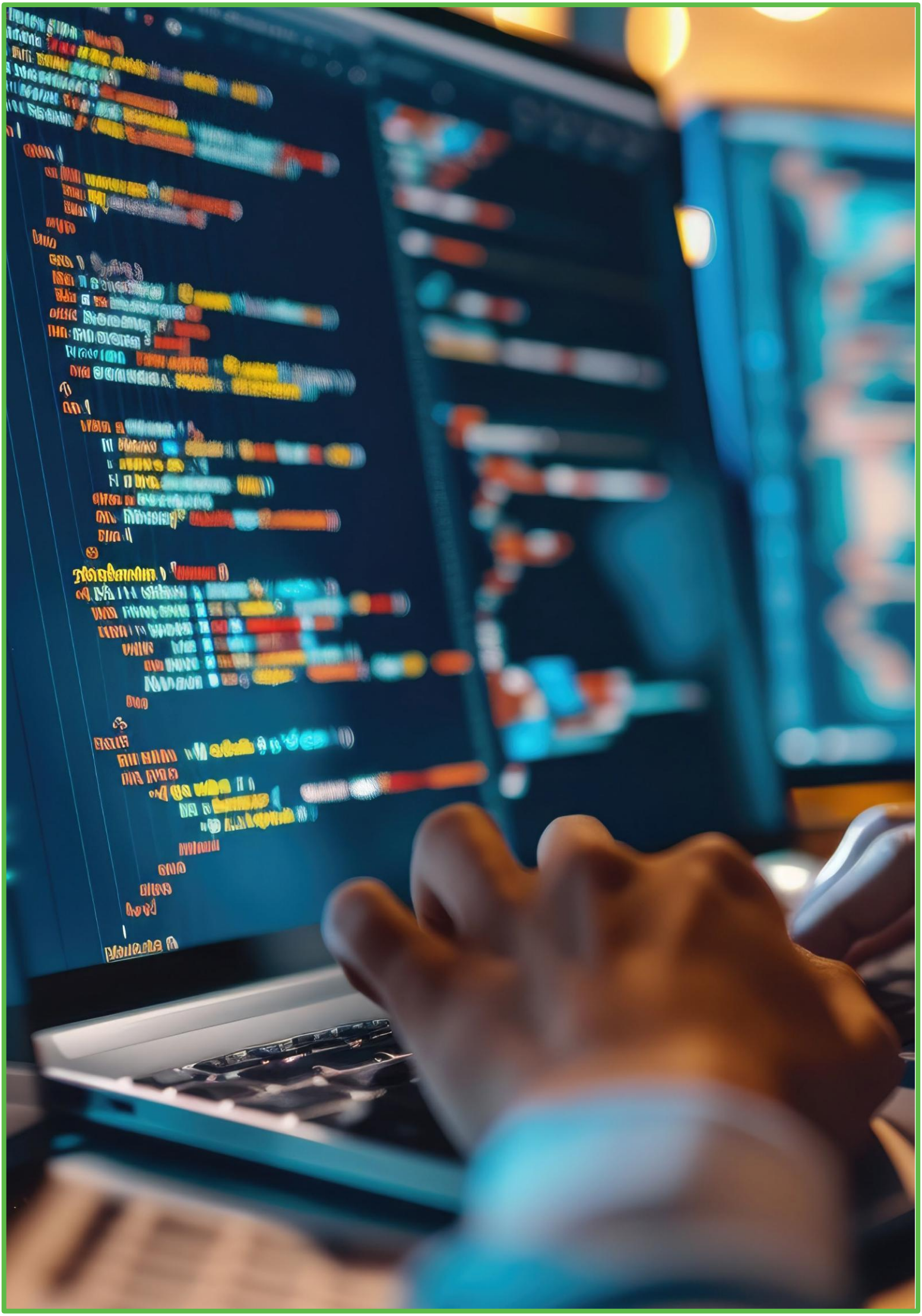
On the other side of the spectrum, some banks prioritise a business-value-driven strategy over a focus on the regulatory requirements. They channel efforts into data modernisation initiatives, analytics projects and operational improvements that are designed to deliver tangible short-term and long-term sustainable results, rather than building comprehensive data lineage that produces little to no actionable insight. These banks accept the risk of regulatory findings and consider supervisory actions as manageable consequences. Whilst this approach may postpone or reallocate the effort, it does not remove the obligation. Repeated findings and supervisory escalation will ultimately result in sanctions, and lower leeway to address data lineage with flexible, pragmatic solutions.

### Pragmatism over perfection

Therefore, delivering regulator-accepted data lineage is ultimately unavoidable. One practical solution is to focus data lineage investments where data risk is high – thus addressing core regulatory expectations – and business value is greatest. Banks that follow this approach recognise that neither gold-plated compliance programmes nor deliberate regulatory exposure represent a sustainable long-term strategy. They adopt a pragmatic, risk-based approach, focusing on meeting the ‘spirit of the law’ rather than mechanically satisfying every literal regulatory requirement.

### Regulatory risk tolerance shapes strategy

Although there is no silver bullet for data lineage yet, we see banks increasingly meeting supervisory intent with a proportionate, well-reasoned approach that focuses on actual data risk, without sacrificing major resources to low-value initiatives. What can be clearly observed across the industry are the specific levers that banks tweak to fit their data lineage programme to their regulatory risk tolerance, in combination with their business risk appetite.



# Levers to bridge regulatory intent and operational reality

Banks operationalize a data lineage strategy by making informed choices along four key levers:

- **Scope of application**
- **Granularity**
- **End-to-end coverage**
- **Execution**

These levers translate high-level strategy into concrete design decisions that determine where and how much effort the bank invests, and how sustainable the documentation, tooling and maintenance of data lineage becomes. By adjusting these levers coherently, a bank aligns regulatory expectations, business value and operational feasibility and ensures that data lineage remains proportionate, purposeful and defensible in supervisory dialogue.

# Scope of application

"Scope defines the playing field: set it deliberately, or lineage becomes unmanageable"

### KRI & Reports

Setting the right scope of application is the most powerful lever banks use before modelling a single line of its data lineage. Defining scope requires banks to make several decisions. Across the industry, we see efforts from banks to rationalise reporting, to redefine the universe of applications, reports and KRIs that fall within the RDARR scope of application. While the RDARR Guide lists a set of reports that are considered in scope of application, there is room for interpretation, especially in relation to internal risk reporting that can be used. One common approach is to apply a relevance-based filter, focusing on the applications, reports and KRIs that genuinely inform senior management or influence board-level decision-making. This pragmatic method significantly reduces resource constraints and effort. Establishing reports and KRIs where BCBS 239 standards are not fully needed enables a bank to maintain supervisory defensibility and remain consistent with the intent of the regulation. Setting the perimeter for application, reports and KRIs therefore determines how manageable, defensible and value-aligned the entire data lineage initiative will be.

### CDEs

After defining the appropriate KRIs and reports, banks must also determine the scope of their CDEs. When a bank treats all data flowing into a report or KRI as equally important, the CDE perimeter grows rapidly and becomes difficult to control. Although this reduces the likelihood of supervisory challenge, it raises legitimate questions about the cost–benefit ratio. At that point, the initiative shifts away from meaningful data lineage towards a data archaeology exercise. To tackle this problem, some banks use scorecards, validation rules, expert judgement and dependency analyses to identify which data elements truly drive KRIs and reports. Others avoid unnecessary documentation by selecting only those CDEs with material impact and referencing existing artefacts such as statements of operation and technical handbooks. This results in a reduced, but defensible, perimeter that meets supervisory expectations without excessive effort.

### Legal entities and subsidiaries

Besides the inclusion of applications, reports, KRIs and CDEs, which are without a doubt the biggest drivers, banks need to consider which legal entities and subsidiaries they want to include in the data lineage perimeter and which they leave to handle independently. By applying a materiality-based selection process, banks can focus on significant legal entities and subsidiaries where the data materially affects the calculation of key risk and regulatory metrics. Some banks identify relevant legal entities and subsidiaries in the annual risk inventory, while others use approaches based on Risk-Weighted Asset (RWA) materiality. Materiality-based selection processes keep the perimeter focused and defensible while avoiding unnecessary complexity.

### Strategic relevance

Defining the appropriate scope of application plays a pivotal role in shaping the effectiveness of any data lineage programme. The decisions about which applications, reports, KRIs, CDEs, legal entities and subsidiaries to include directly influence the cost, complexity and business value of data lineage. When banks define scope carefully and transparently, they create a defensible boundary that meets regulatory expectations without overwhelming the organisation with unnecessary documentation.

# Granularity

## ‘Granularity determines whether lineage becomes meaningful insight or overwhelming noise.’

Granularity defines how detailed a bank documents data lineage, and it is one of the most important levers for balancing regulatory expectations with operational feasibility. The supervisory expectation regarding granularity is made clear in the RDARR Guide to be a ‘complete and up-to-date data lineage on data attribute level’. However, the ECB RDARR Guide does not clarify whether a data attribute should be considered from a technical or business perspective, nor does it specify if atomic fields are intended.

The level of detail selected and where it applies for the data lineage documentation determines whether data lineage provides clear transparency into how data is produced or becomes an overly complex, costly and unsustainable exercise that delivers little business value. Granularity can range from high-level conceptual flows to field-level mappings of every transformation, and the appropriate depth varies widely across the data landscape.

### Our benchmark analysis

In practice, the approaches chosen by European banks vary widely. Most often, banks adjust data lineage granularity selectively and focus on detail where it has the greatest impact or business value. For instance, a bank used a mixed-granularity model that adjusted the level of detail throughout its data flow. Upstream source systems and initial data layers were described in broad, conceptual terms to avoid unnecessary complexity. Within the data warehouse, aggregation and transformation processes were documented at the table level, giving clear insight into important processing steps. Detailed documentation at the field level, including full transformation chains, was reserved only for risk-relevant outputs such as values used in capital ratios, liquidity metrics and large-exposure calculations. This approach gave regulators the transparency they needed where it mattered most, while keeping the overall workload manageable across the system.

One notable outlier in the granularity spectrum was a mid-sized bank with a highly modern IT landscape that had established its data lineage based on approximately 700 CDEs. This resulted in the documentation of roughly 1.4 million database columns, providing a high level of technical detail and end-to-end lineage transparency.

While this approach effectively avoids regulatory findings, a significant portion of the business-level documentation, particularly the mapping of CDEs to KRIs, remained largely underutilised.

By calibrating granularity deliberately and transparently, banks avoid both extremes, providing too much detail that soon becomes obsolete and costly to manage, or offering too little depth that does not satisfy supervisory standards. Taking a balanced, layered approach enables banks to align the depth of data lineage with actual materiality and operational needs while keeping long-term maintenance both feasible and sustainable.

# End-to-end coverage

"Not all systems are equally relevant – Banks need to make conscious choices to focus their efforts where they have the most impact."

End-to-end coverage defines which systems, applications and data layers fall within the data lineage scope. Whilst the RDARR Guide clearly defines data lineage as 'information about the movement and transformation of data from front (capture) to end [...],' banks must decide what this means in practice. Banks therefore need a clear, risk-aligned rationale where deliberate choices are made on parts of the landscape that contribute to the end-to-end scope and therefore the need for full traceability.

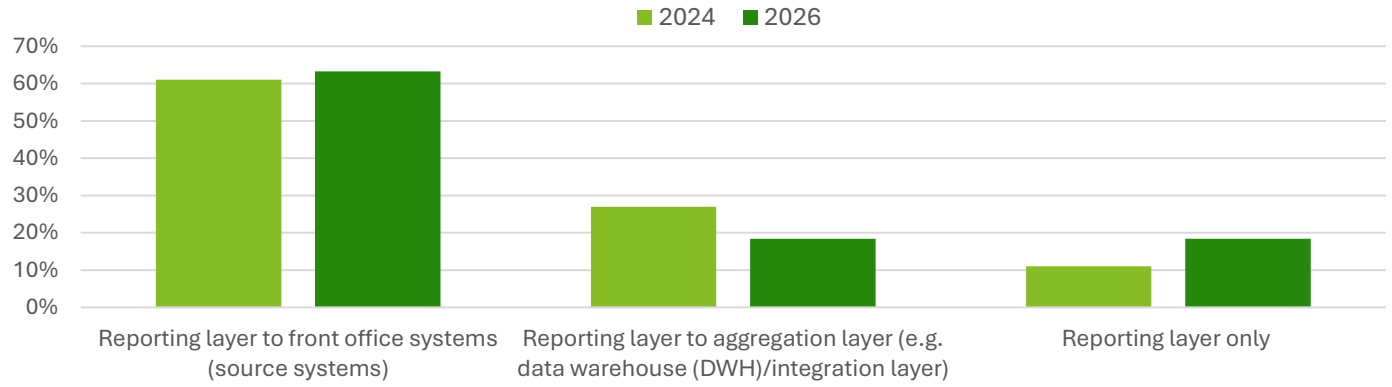
This decision becomes more complex when subsidiaries and other legal entities enter the picture. A bank's data chain rarely starts and ends within a single entity. Data captured through mobile apps, online portals, partner platforms, or core banking systems at legal-entity and subsidiary level feeds into group-level reporting and risk aggregation. Banks need to determine where in this fragmented landscape their lineage perimeter begins. Extending full end-to-end coverage to every legal entity and subsidiary, and every data-capture channel, linking vertical and horizontal, is operationally unrealistic for most institutions. The pragmatic approach is to include significant subsidiaries and material entities in full scope while limiting coverage for smaller entities to those specific data flows where critical information enters the consolidated data chain.

### Our benchmark analysis

Our benchmarking confirms that practices vary considerably across the industry (see Figure 3). The majority of banks trace data lineage from the reporting layer back to front-office and source systems, although practices differ considerably in how far upstream this traceability goes, ranging from lineages that end at systems of record to those that extend further to the true first point of data capture, including early pre-trade and intraday flows.

A notable group, however, still stops at the intermediate aggregation layers or data ware- and lake houses, and a small number cover only the reporting layer itself. Compared to 2024, the trend is moving towards broader coverage, but the distribution shows that a significant portion of the industry has not yet achieved full source system traceability.

**Fig. 3 - Layers covered by data lineage by organizations**




One approach often applied in practice focuses on the systems and data flows that materially influence regulatory, financial, or risk indicators while avoiding exhaustive documentation in domains with limited relevance for reports or indicators in scope of application. Instead of applying a uniform definition across the entire IT landscape, banks differentiate between core systems that require full end-to-end visibility and peripheral or legacy environments where higher-level documentation may be sufficient.

One bank limited its scope by claiming data lineage starts only at its integration hub, excluding the upstream core banking system. This restriction ultimately proved indefensible during supervisory reviews because critical risk-relevant data transformations occurred upstream of the defined entry point. Such examples illustrate why a calibrated but comprehensive view of source system coverage is essential for regulatory credibility.

Having a balanced, risk-aligned definition of end-to-end coverage gives banks complete visibility where it matters most, while preventing the data lineage programme from expanding beyond what is operationally and strategically sustainable.

# Execution

"Execution is the real test of data lineage: without strong tooling and governance, even the best framework collapses under day-to-day business."

Execution determines whether a bank's data lineage programme remains a one-off documentation effort or evolves into a sustainable capability embedded in daily operations. Scope of application defines what is included, granularity sets information depth, and end-to-end coverage outlines breadth, but execution drives delivery, maintenance, and adaptation. Effective execution rests on two pillars: the tooling and technology that enable efficient capture, visualization and maintenance of data lineage, and the governance and process integration that ensure accuracy over time.

### Capture and maintenance of data lineage

Modern tooling has reshaped what is feasible in data lineage documentation. Banks increasingly rely on dedicated lineage platforms, metadata repositories and automation that extract technical data lineage from code, Extract, Transform & Load (ETL) data pipelines, databases and system logs. These capabilities significantly reduce manual effort where the technology landscape is structured and modern. Banks prioritising fulfilling regulatory expectations over maximising business value depend heavily on such tooling to maintain the extensive field-level documentation. However, banks prioritising business value focus investment in modern technologies, often more aggressively, but for different reasons: they focus on tooling that supports business value, such as modern data platforms and analytics environments, while intentionally limiting investment in automation for legacy systems where the costs of full data lineage coverage outweigh the benefits. Most banks seek to find a balanced path: apply tooling to high-material data flows where data lineage quality is essential, while relying on higher-level or referenced documentation for less critical parts of the architecture, resulting in lower granularity. This allows them to remain proportionate in effort without compromising defensibility.

### Governance and process integration

Execution, however, does not depend on technology alone. Governance, most often realised in the form of a central data governance office, defines who owns data lineage, how it is maintained, and how it is embedded in day-to-day processes. Additionally, the validation function in the second line of defence independently verifies that governance processes are implemented as intended through established controls. Banks that distribute ownership across data domains, CDEs, or systems create clear accountability and reduce the risk of documentation becoming outdated. Integrating 'data lineage by design' in business processes is crucial: any system update, data-model change, or new regulatory requirement must automatically trigger a review of whether the data lineage remains accurate and complete. This is supported by efficient and effective training programmes where data lineage is about more than just compliance. Banks that get this balance right excel in this area, because they concentrate governance and ongoing efforts to identify and manage change and maintenance efforts where accuracy matters most.

### The combination of both

Execution ultimately determines whether a data lineage programme becomes resilient or fragile. Strong tooling accelerates documentation and improves accuracy, while robust governance ensures that data lineage keeps pace with technological change and regulatory developments. Banks that combine both elements and align them with their chosen risk profile establish a sustainable operating model that delivers transparency where it matters, avoids unnecessary effort, and remains defensible under supervisory scrutiny.

# Reaping the benefits of data lineage

The operational levers determine how much effort, cost, and complexity a bank's lineage programme carries. But the calibration of these levers also shapes something else: the range of benefits an institution can extract from its lineage investment beyond regulatory compliance.

A sound data lineage generates benefits that go beyond mere compliance with regulatory expectations and confidence in the quality of key decision-making metrics and reports. These benefits include, amongst others:

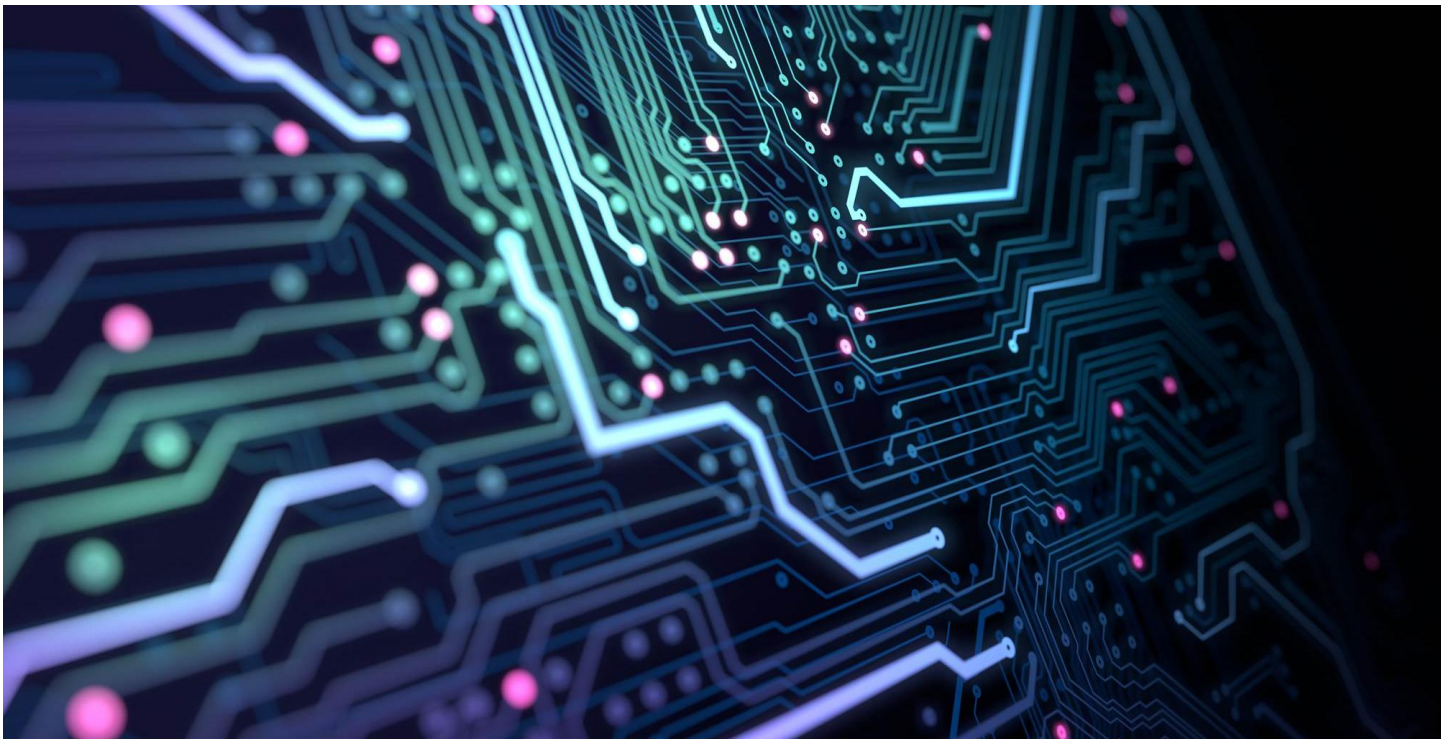
In short, data lineage supports a wide range of initiatives to enhance IT and data architectures. Looking ahead, as new AI and GenAI capabilities source more and more data, data lineage becomes an asset that effectively supports sound and intensive data usage across the entire organisation..

**Improved understanding of system dependencies and data flows,** significantly reducing analysis time and efforts to support IT & data system changes

**A significant reduction of time and costs of root** cause identification in data aggregation and reporting errors

**Identification of obsolete applications and processes** to drive decommissioning initiatives and IT & data architecture optimization

**Reduced efforts to implement and execute data quality controls** (that can be streamlined and simplified implementing controls where data are generated) without redundancies



# From today's constraints to tomorrow's capabilities

### Evolution of data lineage

Data lineage strategies that balance regulatory compliance with business value are not static. Over the coming years, AI, modern metadata technologies, and platform modernization will reshape how banks approach data lineage. The strategic choices banks make today will be influenced by the technological capabilities available to them, and the banks that anticipate the future position can benefit from such foresight.

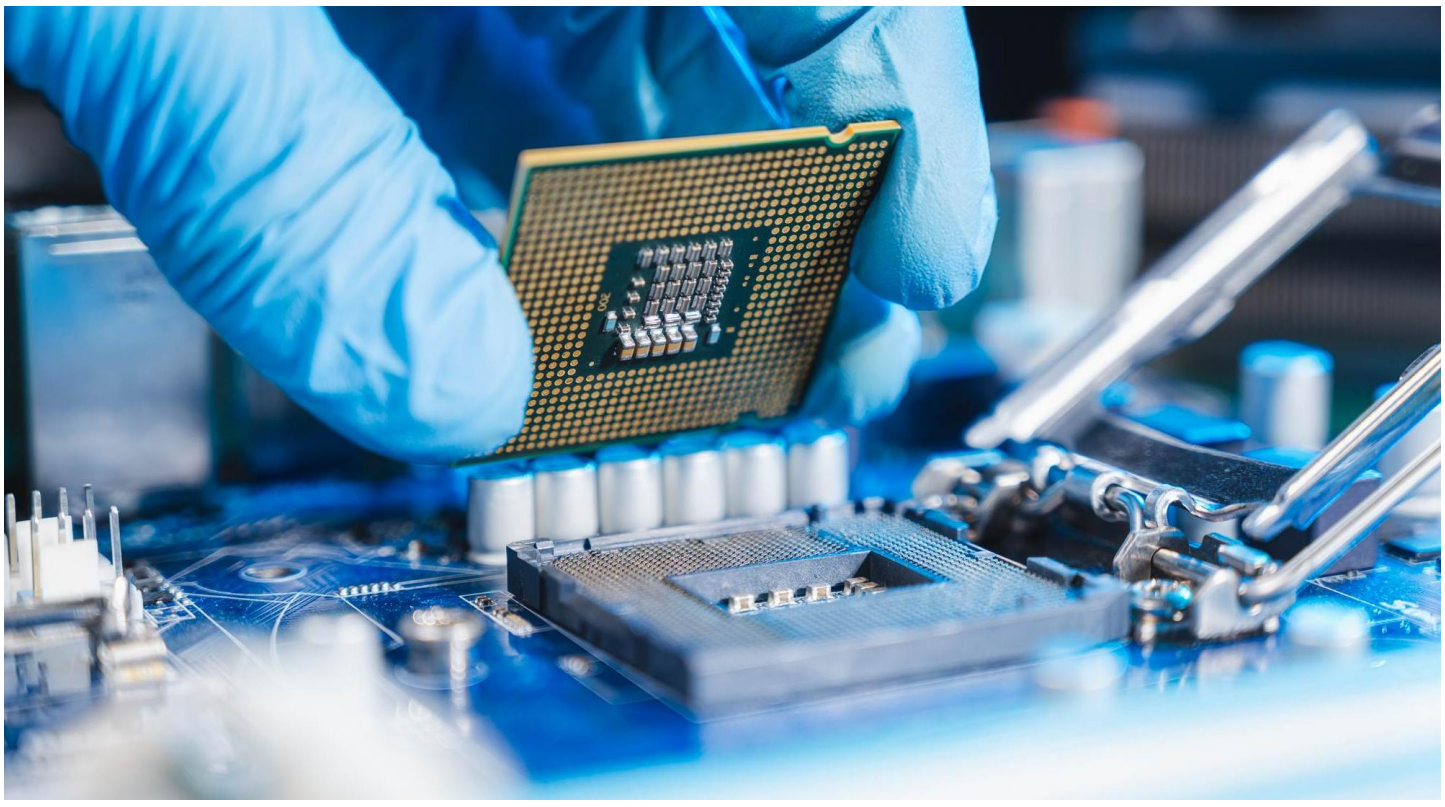
The most fundamental change is already underway. As banks replace legacy systems with modern data warehouses, regulatory reporting platforms, and cloud-native architectures, data lineage metadata is typically included natively by design. What previously required extensive manual documentation effort becomes a byproduct of the system architecture itself. This does not eliminate the need for data lineage governance but shifts the effort from building data lineage after the fact, to configuring and validating data lineage that is continuously generated.

### From compliance to competitive advantage

AI and modern metadata technologies accelerate this trajectory further. Automated data lineage discovery, change-impact analysis, and anomaly detection are becoming the reality. These tools can scan codebases, ETL configurations, and database structures to reconstruct data lineage paths at a speed and scale that manual approaches cannot match. However, automation does not mean autonomy. AI-generated data lineage still requires governance frameworks and human validation and thus still significant cost due to the huge amount of detail generated to ensure accuracy, completeness, and regulatory acceptability. A data lineage path reconstructed by an algorithm is only as credible as the review process validating it.

### A Balanced Solution

However, legacy systems remain a reality for most institutions and will do so for the foreseeable future. These systems do not emit metadata natively and require compensating controls, manual documentation, and higher operational effort until they are replaced or refactored. The pragmatic conclusion is that banks will have to operate in a hybrid world, managing native, automated data lineage for modern platforms alongside manual, higher-effort data lineage for legacy components. The banks that navigate this transition process most effectively are those that align data lineage investment to the modernisation roadmap, investing heavily in automation where the infrastructure supports it and accepting pragmatic, well-governed manual processes where it does not.



# Conclusion

## Summary & Outlook

The current regulatory ambition for data lineage places significant pressure on banks. Data lineage remediation activities are costly, compete with value-generating modernisation initiatives for the same resources, and risk delivering marginal business value when implemented without a clear strategic rationale. AI and modern data platforms will progressively shift the effort from manual documentation to native, automated data lineage captured by design. This will not eliminate the challenge overnight, but it will fundamentally change the playing field.

While some areas continue to evolve, the prevailing industry standard is to adopt a pragmatic, risk-based approach. Banks must remain adaptable to emerging innovations; however, they should clearly define their scope, deliberately calibrate the level of detail to focus on what is materially significant, and strategically expand end-to-end coverage where it aligns with regulatory and business objectives. Effective operational levers are available; the key consideration is the extent to which institutions are prepared to invest in leveraging them.

For institutions looking to accelerate their progress, combining internal capabilities with deep cross-industry experience in RDARR implementation, risk-based lineage design, and regulatory dialogue can materially shorten the path from ambition to operational reality.

For a more detailed discussion of the approaches outlined and their potential application, please contact us.

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