

NOVA

IMS

Information
Management
School

MDSAA

Master Degree Program in
Data Science and Advanced Analytics

**Revolutionizing Data Management in the Financial Sector: A
Data Mesh Approach to Governance, Compliance, and
Scalability**

*Challenges, Opportunities, and Practical Implications for Financial
Institutions*

Pedro Henrique Cabral Adonis

Master Thesis

presented as partial requirement for obtaining a Master's Degree in Data Science and Advanced Analytics

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação

Universidade Nova de Lisboa

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

**Revolutionizing Data Management in the Financial Sector: A Data Mesh Approach to
Governance, Compliance, and Scalability**

Challenges, Opportunities, and Practical Implications for Financial Institutions

by

Pedro Henrique Cabral Adonis

Master Thesis presented as partial requirement for obtaining the Master's degree in Data Science and Advanced Analytics, with a specialization in Business Analytics

Supervised by

Mijail Naranjo-Zolotov, PhD, Nova Information Management School (NOVA IMS),
Universidade Nova de Lisboa.

March, 2025

STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Brussels, 20/03/2025

DEDICATION

I dedicate this work to my past self, who never imagined leaving my hometown in Brazil. This journey has been a testament to growth, resilience, and the pursuit of new horizons.

ACKNOWLEDGEMENTS

I would like to thank my supervisor, Professor Mijail Naranjo-Zolotov, PhD, for his guidance and feedback throughout this research. His support was essential in helping me structure and refine this thesis.

I also appreciate the professionals who participated in the interviews, sharing their experiences and perspectives. Their contributions added practical insights that enriched this study.

A special thanks to my family and friends for their support during this process. Their encouragement made a difference.

Finally, I acknowledge my past self, who once thought leaving my hometown in Brazil was impossible. This work is a reminder of how much can change with time and effort.

ABSTRACT

Data management in the financial sector faces persistent challenges, including data silos, regulatory compliance, scalability, and interoperability. This study explores how Data Mesh principles—decentralized data ownership, federated governance, and self-service infrastructure—can address these issues. Using a combination of semi-structured interviews with industry professionals and an extensive literature review, the research assesses both the potential benefits and the obstacles of adopting Data Mesh in financial institutions. A Financial Mapping Model is introduced, aligning Data Mesh concepts with the specific demands of the financial sector. Findings suggest that federated governance, domain-driven ownership, and self-service data platforms enhance scalability, regulatory compliance, and operational efficiency. However, key challenges remain, particularly in standardizing governance frameworks and ensuring effective cross-team communication. This study contributes to the field by providing a structured approach for financial institutions seeking to transition from traditional, centralized architectures to a more scalable and compliant decentralized data framework.

KEYWORDS

Data Mesh; financial data governance; decentralization; compliance; interoperability; scalability

Sustainable Development Goals (SDG):



Contents

- 1. Introduction.....1
- 2. Literature review3
 - 2.1. Data Mesh: Definition and Core Principles3
 - 2.2. Data Governance and Regulatory Compliance in Financial Institutions4
 - 2.3. Case Studies: Data Mesh in Banking and Fintechs4
 - 2.4. Overcoming Data Silos in Financial Institutions5
 - 2.5. State of the Art: Data Mesh in Financial Institutions6
 - 2.6. Specificities of Financial Data Management7
- 3. Theoretical model and hypothesis development.....9
 - 3.1. Theoretical Model9
 - 3.2. Hypothesis Development10
 - 3.3. Theoretical Model Framework11
 - 3.4. Hypothesis Summary Table11
- 4. RESEARCH Methodology and Interview Analysis13
 - 4.1. Research Approach.....13
 - 4.2. Data Collection: Semi-Structured Interviews and participants.....13
 - 4.3. Thematic Analysis of Interviews15
 - 4.4. Adoption of Data Mesh in Finance is Limited15
 - 4.5. Scalability and Autonomy16
 - 4.6. Governance and Compliance Challenges16
 - 4.7. Communication and Cross-Domain Collaboration.....17
 - 4.8. Overcoming Redundancy and Data Silos.....17
 - 4.9. Data as a Product and Quality Assurance18
 - 4.10. Summary of Key Findings18
 - 4.11. Limitations of the Study20
 - 4.12. Summary of Interview Findings.....20
 - 4.13. Interview Results Overview.....21
 - 4.14. Scalability and Decentralization in Financial Data Management.....21
- 5. Governance and Compliance Challenges23
 - 5.1. Operational Challenges of Implementing Data Mesh23
 - 5.2. Communication Challenges in a Decentralized Data Structure24
 - 5.3. Trade-offs in Implementation: Balancing Autonomy and Governance25
 - 5.4. Summary of Key Insights25
 - 5.5. Final Considerations26

- 6. Implications and Recommendations27
 - 6.1. Practical Considerations for Data Mesh Implementation in Financial Institutions27
 - 6.2. Trade-offs in Implementing Data Mesh28
 - 6.3. Future Research Directions29
 - 6.4. Final Considerations31
- 7. Conclusion32
 - 7.1. Key Findings.....32
 - 7.2. Limitations33
 - 7.3. Final Remarks33
- 8. Bibliographical References34
- 9. Appendix.....36

LIST OF FIGURES

Figure 3.1 – Financial Needs Aligned with Data Mesh Principles	10
--	----

LIST OF TABLES

Table 9.3 – Saxo Bank: Data Mesh Key Takeaways.....	5
Table 9.5 – Key Studies on Data Mesh in Finance.....	6
Table 3.3 – Mapping Financial Needs to Data Mesh Solutions.....	11
Table 3.4 – Research Hypotheses and References	12
Table 4.2 – Profile of Interview Participants.....	15
Table 4.10 – Key Insights and Challenges Identified by Participants.....	19
Table 5.4 – Themes, Insights, and Implications for Data Mesh in Finance.....	26
Table 6.1 – Key Steps for Implementing Data Mesh in Financial Institutions	27
Table 6.2 – Data Mesh Trade-Offs and Mitigation Strategies in Finance	28
Table 6.3 – Future Research Priorities for Data Mesh in Finance.....	30

LIST OF ABBREVIATIONS AND ACRONYMS

API	Application Programming Interface – A set of rules and protocols enabling communication between software systems.
BI	Business Intelligence – Technologies and practices for collecting, integrating, analyzing, and presenting business information.
CTO	Chief Technology Officer – Executive responsible for technological innovation and IT strategy.
ETL	Extract, Transform, Load – A process used in data warehousing for data integration from multiple sources.
GDPR	General Data Protection Regulation – European Union regulation on data protection and privacy.
KPI	Key Performance Indicator – A measurable value used to track the success of specific objectives.
SDG	Sustainable Development Goals – A set of global objectives adopted by the United Nations to promote sustainable development.

1. INTRODUCTION

Financial institutions deal with large volumes of data on a daily basis, including transaction records, risk assessments, and regulatory reports. However, traditional centralized architectures—such as data warehouses and data lakes—often lead to information silos. In these environments, data is stored in isolated systems across different departments, making it difficult to access and analyze in an integrated manner (Jejeel-Ojuade, 2024; O. White et al., 2021). This fragmentation can compromise the consistency of financial reporting and risk assessments, directly affecting decision-making and regulatory compliance (J. Soldatos & Kyriazis, 2022).

Moreover, the integration between legacy systems and newer technologies remains a significant challenge. A report by IBM (B. Dias et al., 2023) highlights how the lack of interoperability across systems within financial institutions increases processing costs and reduces operational efficiency. In response to these challenges, alternative architectural models have emerged, such as Data Mesh, which promotes the decentralization of data ownership, allowing business domains to manage their own data assets.

While the concept of Data Mesh has gained attention in fields like healthcare and smart cities (Falconi & Plebani, 2023; Krystek et al., 2023), its application in the financial sector remains limited and underexplored in the literature. One of the few documented cases in regulated institutions is the Saxo Bank study (Joshi et al., 2021). There, the implementation of federated governance led to improvements in data quality and internal agility. However, the study also revealed notable challenges, especially in standardizing compliance rules across business domains.

In less regulated environments, such as fintechs, Data Mesh initiatives have been applied with more flexibility. For instance, companies operating under Open Banking frameworks are using microservices and APIs to structure their data by domain, naturally aligning with the Data Mesh model. Still, these implementations face difficulties with data traceability and the clear definition of responsibilities among teams.

This study investigates whether Data Mesh principles—such as decentralized data ownership, federated governance, and data-as-a-product—can be effectively applied in financial institutions without compromising regulatory and security requirements. The research is based on interviews with professionals working in data roles across banks, fintechs, and technology companies, as well as the development of a conceptual simulation adapted to the unique characteristics of the financial sector.

The goal is to understand whether decentralization can genuinely improve data quality and operational efficiency, and to what extent governance and compliance risks can be mitigated. The analysis is grounded in the theoretical principles of Data Mesh (Dehghani, 2021) and

practical requirements imposed by regulatory bodies such as the European Central Bank and frameworks like GDPR and Basel III.

This thesis aims to address a gap in the literature by exploring how decentralized architectures can transform data management practices in the financial sector. The intention is to provide practical guidance for institutions considering the adoption of the Data Mesh model but still facing concerns about the regulatory, operational, and cultural impacts of this transition.

2. LITERATURE REVIEW

The increasing complexity of financial data management has led institutions to seek more scalable, interoperable, and compliant data architectures. Traditional centralized approaches, such as data warehouses and data lakes, have struggled to keep pace with the growing volume, velocity, and variety of financial data. These architectures frequently result in data silos, operational bottlenecks, and governance inefficiencies, limiting real-time decision-making and regulatory compliance (B. Dias et al., 2023; Joshi et al., 2021; O. White et al., 2021).

In response to these challenges, Data Mesh has emerged as a decentralized alternative, aiming to improve data ownership, governance, and accessibility while ensuring compliance with financial regulations such as Basel III, GDPR, and Dodd-Frank (Ibrahim Adedeji Adeniran et al., 2024; J. Soldatos & Kyriazis, 2022). However, adopting Data Mesh in financial institutions presents unique regulatory, operational, and technological challenges, which this section aims to explore by reviewing key theoretical foundations, governance considerations, and real-world applications of Data Mesh in the financial sector.

2.1. DATA MESH: DEFINITION AND CORE PRINCIPLES

Data Mesh represents a paradigm shift from centralized data platforms to domain-oriented, decentralized data management, fostering greater scalability and operational efficiency (Dehghani, 2021). Unlike data warehouses and lakes, which centralize ingestion, transformation, and access, Data Mesh assigns data ownership to domain-specific teams, allowing organizations to improve real-time analytics, autonomy, and governance (Machado et al., 2021a; Wider et al., 2023).

Core Principles of Data Mesh

Data Mesh is based on four core principles: domain-oriented data ownership, which assigns data responsibility to business units; data as a product, emphasizing quality and usability; self-serve data infrastructure, providing teams with tools to manage their data; and federated computational governance, which enforces security and compliance policies across domains.

Challenges in Applying Data Mesh to Financial Institutions

Despite its benefits, the application of Data Mesh in financial institutions introduces unique challenges, particularly in terms of data security, regulatory compliance, and governance standardization (Jeleel-Ojuade, 2024; J. Soldatos & Kyriazis, 2022). Regulatory frameworks such as Basel III, GDPR, and Open Banking impose strict data privacy, auditability, and access

control requirements, making financial institutions more resistant to full decentralization (Gatla, 2024; Ibrahim Adedeji Adeniran et al., 2024).

2.2. DATA GOVERNANCE AND REGULATORY COMPLIANCE IN FINANCIAL INSTITUTIONS

Financial institutions operate in a highly regulated environment, where data governance frameworks must ensure compliance, security, and auditability. Unlike other industries, financial data is subject to strict regulatory oversight, including requirements for data lineage, risk mitigation, and fraud detection (B. Dias et al., 2023; Joshi et al., 2021).

Federated Governance in Financial Institutions

Studies indicate that federated governance models can improve regulatory compliance while maintaining data autonomy (Joshi et al., 2021). Instead of enforcing rigid centralized control, financial organizations can embed compliance rules into domain-specific data products, aligning with the Data Mesh paradigm (Wider et al., 2023).

Key governance mechanisms supporting Data Mesh in finance include:

- Automated policy enforcement using metadata-driven security frameworks (e.g., Apache Atlas, Open Policy Agent) (B. Dias et al., 2023).
- Standardized data-sharing agreements to ensure cross-domain regulatory compliance (Geisler et al., 2021).
- AI-driven fraud detection and anomaly detection, enhancing real-time risk monitoring and auditability (Ibrahim Adedeji Adeniran et al., 2024; O. White et al., 2021).

A critical challenge in federated governance is balancing autonomy and compliance—ensuring domain teams retain flexibility while meeting regulatory standards (Gatla, 2024; J. Soldatos & Kyriazis, 2022).

2.3. CASE STUDIES: DATA MESH IN BANKING AND FINTECHS

Saxo Bank: A Practical Implementation of Data Mesh

A notable example of Data Mesh adoption in regulated finance is Saxo Bank, which implemented federated data governance to enhance compliance and operational efficiency (Joshi et al., 2021). Key takeaways include:

Table 2.3 – Saxo Bank: Data Mesh Key Takeaways

Takeaway	Impact
Decentralized domain ownership	Improved data accuracy and consistency across business teams
Automated compliance tools	Ensured adherence to regulations (e.g., Basel III, GDPR)
Governance standardization challenges	Different domains interpreted rules differently, requiring clearer policies

Fintechs and Open Banking

The rise of Open Banking APIs has accelerated Data Mesh adoption among fintechs, where microservices and API-based architectures align well with domain-driven data models (Ibrahim Adedeji Adeniran et al., 2024). Key findings from fintech case studies include:

- Self-service data platforms have improved operational scalability and compliance management (Panigrahy et al., 2023).
- AI-driven compliance automation has strengthened real-time fraud detection and regulatory reporting (Gatla, 2024).
- Interoperability frameworks ensure data integrity and security across multiple regulatory environments (Geisler et al., 2021).

Despite these advantages, fintechs adopting Data Mesh face challenges in maintaining data lineage and enforcing governance, especially as regulations evolve (B. Dias et al., 2023).

2.4. OVERCOMING DATA SILOS IN FINANCIAL INSTITUTIONS

Data silos occur when departments store and process data independently, leading to fragmentation, duplication, and inconsistencies (Jeleel-Ojuade, 2024). Traditional data warehouses attempt to integrate siloed data, but they often suffer from scalability limitations, high costs, and slow processing times (Frischbier et al., 2020).

How Data Mesh Solves the Silo Problem

Research suggests that Data Mesh mitigates silos by:

1. Structuring data around business domains, ensuring localized ownership while improving interoperability (Machado et al., 2021b).
2. Decoupling data pipelines, reducing dependency on centralized ETL processes (O. White et al., 2021).

3. Enhancing data discoverability through metadata cataloging and standardization (B. Dias et al., 2023).

However, transitioning to domain-oriented architectures requires strong coordination between business and IT teams, as poorly implemented decentralization can create new silos (J. Soldatos & Kyriazis, 2022).

2.5. STATE OF THE ART: DATA MESH IN FINANCIAL INSTITUTIONS

The table below summarizes key studies examining Data Mesh adoption in financial institutions:

Table 2.5 – Key Studies on Data Mesh in Finance

Study	Focus	Key Findings
(Dehghani, 2021)	Data Mesh paradigm	Defines core principles and practical applications.
(Machado et al., 2021a)	Data Mesh in enterprise data architectures	Highlights scalability, governance, and autonomy benefits.
(Joshi et al., 2021)	Federated governance at Saxo Bank	Demonstrates improved compliance and data quality.
(Wider et al., 2023)	Governance in decentralized data architectures	Proposes computational governance mechanisms.
(J. Soldatos & Kyriazis, 2022)	Big data architecture in finance	Emphasizes interoperability and real-time decision-making.
(Ibrahim Adedeji Adeniran et al., 2024)	Risk management and compliance in finance	Highlights the importance of structured governance frameworks.
(B. Dias et al., 2023)	Data interoperability in financial services	Discusses challenges and best practices for financial data integration.

Final Considerations

By expanding the discussion with sector-specific case studies, federated governance models, and financial data compliance challenges, this literature review provides a comprehensive foundation for analyzing Data Mesh adoption in financial institutions.

2.6. SPECIFICITIES OF FINANCIAL DATA MANAGEMENT

Financial institutions exhibit a unique data landscape shaped by stringent regulatory requirements, operational complexity, and heightened sensitivity to data integrity. Unlike other sectors such as retail, media, or even healthcare, financial data is directly tied to monetary value and subject to continuous supervision by regulatory bodies such as the European Central Bank, the Basel Committee on Banking Supervision, and data protection authorities under GDPR.

The data architecture in financial institutions is typically organized around core business functions, including credit and loan processing, risk assessment, fraud detection, investment management, and regulatory reporting. These functions often operate across distinct departments, resulting in specialized and compartmentalized data environments. For instance, credit risk data may be managed independently from compliance or trading data, each with its own storage, governance, and access policies (Ibrahim Adedeji Adeniran et al., 2024).

Moreover, financial institutions often rely on legacy core banking systems—monolithic and highly interdependent platforms that have been developed over decades. These systems are typically complemented by newer digital channels, cloud infrastructures, and data lakes, leading to hybrid data architectures. The coexistence of old and new technologies creates significant challenges for data integration and consistency, exacerbating the problem of data silos (Frischbier et al., 2020; Gaddam, 2024).

Another defining characteristic of financial data management is the requirement for high-frequency processing, real-time analytics, and granular auditability. Regulatory frameworks such as BCBS 239 mandate that financial institutions maintain detailed data lineage and ensure the accuracy, completeness, and timeliness of risk data (J. Soldatos & Kyriazis, 2022). Similarly, Know Your Customer (KYC) and Anti-Money Laundering (AML) protocols require the traceability and secure handling of personally identifiable information (Geisler et al., 2021).

In contrast to industries where data ownership can be more flexibly assigned to business units, the financial sector often demands centralized oversight mechanisms to prevent compliance breaches and operational risks. Thus, implementing decentralized models such as Data Mesh requires reconciling domain-oriented autonomy with strong governance, standardized metadata management, and automated regulatory enforcement (B. Dias et al., 2023; Wider et al., 2023).

These unique operational and regulatory characteristics make financial data environments significantly more rigid and complex than those of other industries, presenting both a challenge and an opportunity for architectural transformation through paradigms such as Data Mesh.

3. THEORETICAL MODEL AND HYPOTHESIS DEVELOPMENT

3.1. THEORETICAL MODEL

This study proposes a theoretical model integrating Data Mesh principles with financial data governance frameworks to evaluate how decentralized data architectures influence data quality, compliance, and operational efficiency in financial institutions. The model is rooted in distributed systems theory and domain-driven design (DDD), emphasizing the role of federated governance and self-service infrastructure in financial data management.

Key Concepts in the Model:

The model is grounded in three fundamental concepts. Decentralized Data Ownership refers to shifting data management responsibilities to business domains, which enhances data quality and accessibility while reducing bottlenecks in centralized systems (Dehghani, 2021; Machado et al., 2021a). Federated Governance involves embedding compliance rules directly within the data infrastructure to reduce regulatory risks and ensure real-time oversight (Joshi et al., 2021; Wider et al., 2023). Lastly, Self-Service Data Infrastructure empowers autonomous teams to manage, process, and access data independently, fostering greater scalability and interoperability (Hooshmand et al., 2022). Together, these concepts support the model's aim of improving data accessibility and regulatory alignment, enhancing real-time compliance monitoring, and minimizing the risks associated with data fragmentation and inconsistency.

Mechanisms Supporting Data Mesh in Financial Institutions:

Several mechanisms support the application of Data Mesh in financial institutions. Automated policy enforcement, using metadata-driven security frameworks such as Apache Atlas and Open Policy Agent, ensures regulatory compliance is maintained across decentralized teams (B. Dias et al., 2023). Standardized data sharing agreements contribute to improved cross-domain governance and regulatory alignment (Geisler et al., 2021). Moreover, interoperability frameworks facilitate efficient data sharing between departments and external stakeholders, helping reduce silos and enhance collaboration (Jeleel-Ojuade, 2024).

A major challenge is balancing autonomy with compliance—ensuring domain-level flexibility while maintaining organization-wide security and governance controls (Gatla, 2024; J. Soldatos & Kyriazis, 2022).

Financial Mapping with Data Mesh Principles

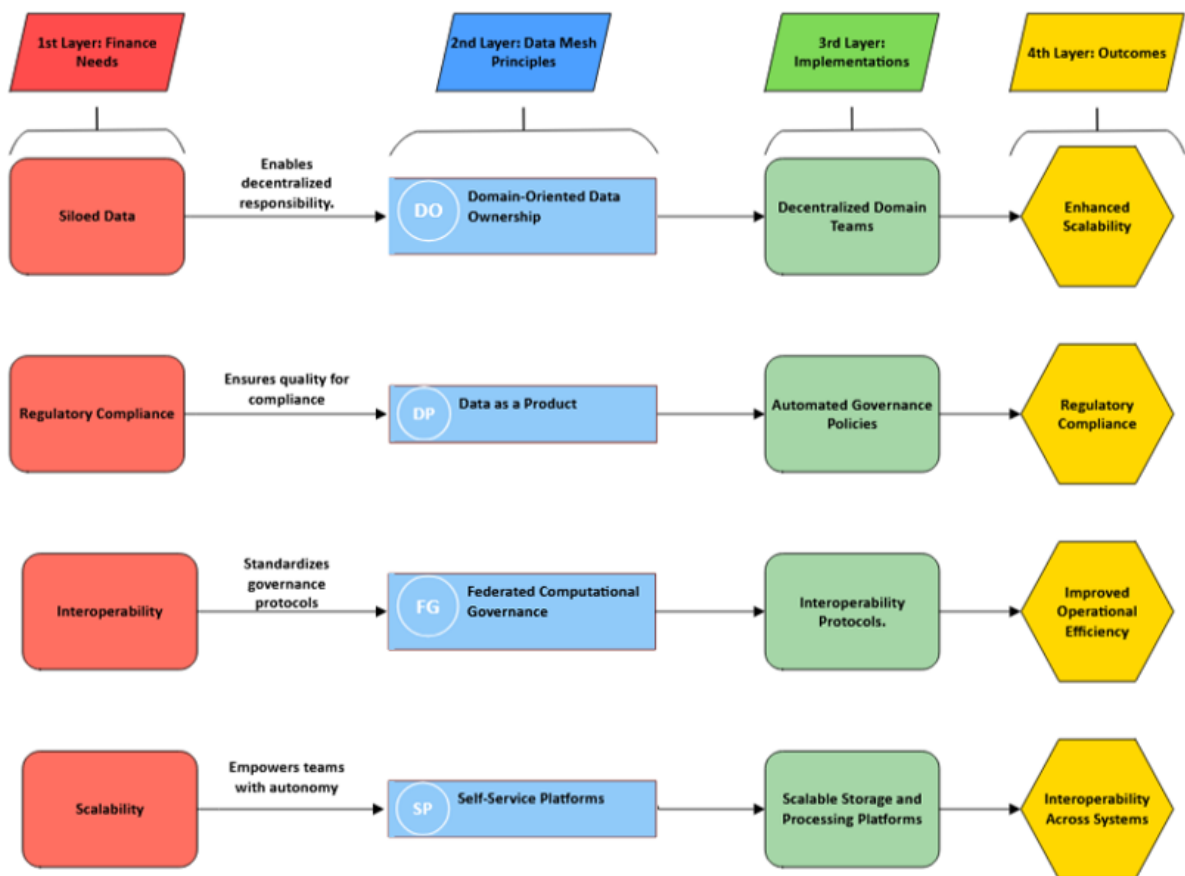


Figure 3.1 – Financial Needs Aligned with Data Mesh Principles

3.2. HYPOTHESIS DEVELOPMENT

H1: Decentralized data ownership improves financial data quality and accessibility.

Traditional centralized architectures often create bottlenecks, limiting the efficiency of data management and decision-making (Dehghani, 2021). Domain-oriented ownership in Data Mesh allows business units to manage their own data, increasing accuracy and usability (Machado et al., 2021a). Studies suggest that federated data governance can improve data consistency while maintaining necessary compliance controls (Joshi et al., 2021).

H2: Federated governance reduces compliance risks in financial institutions.

Financial institutions must comply with strict regulations such as Basel III, GDPR, and Dodd-Frank (Ibrahim Adedeji Adeniran et al., 2024). Traditional governance models rely on centralized oversight, which may lead to inefficiencies in ensuring real-time compliance (Gatla, 2024). Federated governance models embed compliance rules within data infrastructure, reducing risks and increasing transparency (Wider et al., 2023).

H3: Implementing Data Mesh enhances interoperability and reduces information silos.

Financial institutions often struggle with data fragmentation, leading to inconsistencies in reporting and analysis (Jeel-Ojuade, 2024). Data Mesh architecture, by enabling domain-specific data products, facilitates data integration without sacrificing autonomy (Machado et al., 2021). Interoperability frameworks, combined with metadata-driven governance, improve data sharing between departments and external stakeholders (B. Dias et al., 2023).

This model aims to test these hypotheses through case studies and financial data governance implementations. The findings will contribute to understanding how Data Mesh can support financial data governance while ensuring compliance and efficiency.

3.3. THEORETICAL MODEL FRAMEWORK

A structured framework mapping finance needs to Data Mesh principles, implementations, and expected outcomes is presented below:

Table 3.3 – Mapping Financial Needs to Data Mesh Solutions

Finance Needs	Data Mesh Principle	Implementation	Outcomes
Data Silos	Domain-Oriented Data Ownership	Decentralized Domain Teams	Enhanced Data Quality & Accessibility
Regulatory Compliance	Data as a Product	Automated Governance Policies	Reduced Compliance Risks
Interoperability Challenges	Federated Computational Governance	Interoperability Protocols	Improved Operational Efficiency
Scalability	Self-Service Platforms	Scalable Data Infrastructure	Interoperability Across Systems

3.4. HYPOTHESIS SUMMARY TABLE

Table 3.4 – Research Hypotheses and References

Hypothesis	Description	Supporting References
H1	Decentralized data ownership improves financial data quality and accessibility by reducing bottlenecks and enabling domain-oriented data management.	(Dehghani, 2021; Joshi et al., 2021; Machado et al., 2021a)
H2	Federated governance reduces compliance risks by embedding regulatory controls into decentralized data infrastructures.	(Gatla, 2024; Ibrahim Adedeji Adeniran et al., 2024; Wider et al., 2023)
H3	Implementing Data Mesh enhances interoperability and reduces information silos, improving data integration across financial institutions.	(Geisler et al., 2021; Jeleel-Ojuade, 2024; Machado et al., 2021a)

4. RESEARCH METHODOLOGY AND INTERVIEW ANALYSIS

This study employs a qualitative research approach to explore the adoption of Data Mesh in financial institutions. Given the complexity of financial data governance, decentralization, and compliance, in-depth semi-structured interviews were conducted with professionals from various domains within data and technology roles in financial and technology companies. The objective was to gain nuanced insights into practical challenges, benefits, and limitations associated with the implementation of decentralized data architectures in highly regulated environments.

The qualitative approach was chosen because Data Mesh is still an emerging concept in financial services. A structured quantitative assessment would be premature due to the lack of widespread real-world implementations. Instead, gathering expert perspectives through interviews allows for a thematic analysis that identifies key trends, concerns, and practical implications.

4.1. RESEARCH APPROACH

A qualitative research methodology was chosen to explore the practical application of Data Mesh principles in financial institutions. Given that Data Mesh is still an emerging concept in financial services, a qualitative approach allows for an in-depth examination of expert insights, real-world challenges, and industry-specific nuances that may not yet be well-documented in academic literature.

This study relies on semi-structured interviews to gain perspectives from professionals in data engineering, analytics, and governance. Unlike case study research or direct implementation testing, this study focuses on collecting expert opinions to refine the proposed model. The insights obtained are analyzed thematically to identify patterns, challenges, and opportunities in adopting Data Mesh within financial institutions.

4.2. DATA COLLECTION: SEMI-STRUCTURED INTERVIEWS AND PARTICIPANTS

This study employed semi-structured interviews with five professionals working in data-related roles across various industries relevant to financial data management. The interviews, conducted remotely, lasted between 20 and 30 minutes and were designed to allow participants to elaborate on their experiences and perspectives, while ensuring that key research topics were covered.

The selection of participants was guided by purposive sampling, ensuring that interviewees had relevant expertise in data engineering, analytics, and financial data governance. The study

includes professionals from fintechs, large financial institutions, and IT consulting firms, all of whom have experience in implementing or working within decentralized data environments. The participants hold diverse roles such as Senior Data Engineer, Data Analyst, Technical Product Analyst, and Chief Technology Officer (CTO).

The selection criteria included:

- Experience in data management and engineering within the financial sector.
- Direct or indirect involvement with Data Mesh principles in their respective companies.
- Understanding of governance frameworks and regulatory requirements in financial data management.

This selection approach ensured a comprehensive perspective on how Data Mesh is perceived and implemented across different organizational structures and business models.

The interviews focused on five key topics:

1. Current challenges in financial data governance and management.
2. Perceptions of Data Mesh and its potential impact on financial institutions.
3. Scalability and decentralization of financial data.
4. Compliance and security risks in decentralized architectures.
5. Trade-offs between centralization and autonomy in financial data teams.

By structuring the interviews around these core themes, the study was able to capture diverse viewpoints while maintaining a consistent analytical framework for evaluating the implications of Data Mesh adoption in financial institutions.

The following table summarizes the participants' backgrounds:

Table 4.2 – Profile of Interview Participants

Participant	Job Title	Expertise	Industry Focus
P1	Senior Data Engineer at a media and entertainment company	Data architecture, distributed systems, data governance	Media & Financial Data
P2	CTO at a IT Consulting Firm	IT consulting, data governance, software implementation	Financial Services & IT
P3	Senior Data Analyst at a technology company	Data analytics, business intelligence, data governance	E-commerce & Financial Transactions
P4	Data Engineer at IT Consulting Firm	Data engineering, ETL processes, cloud data infrastructure	IT Consulting & Financial Services
P5	Technical Product Senior Analyst at a Fintech	Risk analytics, financial data governance, compliance	Fintech

These professionals were chosen because of their hands-on experience with data governance, financial data architecture, and distributed systems, which are essential for evaluating Data Mesh adoption in financial institutions.

4.3. THEMATIC ANALYSIS OF INTERVIEWS

A thematic analysis was conducted to identify common perspectives, challenges, and differences across the interviews. Five key themes emerged from the discussions, providing a comprehensive view of how Data Mesh principles are perceived and potentially applied in financial institutions.

4.4. ADOPTION OF DATA MESH IN FINANCE IS LIMITED

None of the participants had direct experience with a full-scale Data Mesh implementation in financial institutions. However, all acknowledged the growing importance of decentralized data ownership and federated governance in addressing scalability and operational efficiency issues.

Despite Data Mesh being recognized as a promising paradigm, its adoption in financial institutions remains in early stages due to compliance concerns and the complexity of financial data ecosystems. Participants noted that while decentralized data ownership improves accessibility and agility, financial organizations require rigorous governance mechanisms that may hinder full decentralization.

4.5. SCALABILITY AND AUTONOMY

One of the most cited benefits of Data Mesh was its potential to improve scalability by distributing data ownership across different business domains. This decentralization reduces dependencies on centralized data engineering teams, enabling business units to manage and consume data autonomously.

The Technical Product Analyst at a fintech (P5), highlighted:

"Decentralization allows teams to process and consume data autonomously, without creating bottlenecks in a central system."

Similarly, the Senior Data Engineer at a media company (P1), emphasized that domain-driven data ownership reduces delays in data accessibility:

"Each domain understands their own data better, and by distributing ownership, we improve efficiency and reduce delays in data accessibility."

These insights align with existing research indicating that domain-oriented data ownership increases operational agility while reducing bottlenecks in centralized data teams (Dehghani, 2021; Machado et al., 2021b). However, participants also noted that scalability should not come at the cost of governance, particularly in a regulatory-heavy sector like finance.

4.6. GOVERNANCE AND COMPLIANCE CHALLENGES

Financial institutions must comply with stringent regulations such as Basel III, GDPR, Open Banking, and Sarbanes-Oxley (SOX). The interviewees highlighted that implementing Data Mesh without robust governance structures could lead to regulatory inconsistencies.

The Data Engineer at an IT consulting firm (P4), reinforced the importance of governance:

"Financial data compliance is non-negotiable. We need a clear governance model that ensures security and data integrity without creating unnecessary bureaucracies."

Also the Senior Data Analyst (P3), further noted:

"When multiple teams manage their own data, ensuring consistency across financial reports becomes a major challenge. Compliance rules must be embedded into data products at the domain level."

These perspectives highlight a crucial trade-off: while decentralized governance improves agility, it also introduces risks related to regulatory oversight. Research suggests that federated governance models, metadata-driven governance, and automated compliance enforcement are key to making Data Mesh viable in financial environments (B. Dias et al., 2023; Joshi et al., 2021).

4.7. COMMUNICATION AND CROSS-DOMAIN COLLABORATION

A significant challenge identified across the interviews was cross-domain communication. While decentralization enhances team autonomy, it also complicates collaboration between different data domains, leading to inconsistencies in reporting and KPI definitions.

The first participant elaborated on this issue:

"One of the biggest hurdles is cross-domain communication. While decentralization empowers teams, misalignment in definitions and standards often leads to inconsistencies in reporting."

The fifth participant reinforced this by explaining the role of Finance Transformation teams in fintechs:

"Our Finance Transformation team acts as a bridge between data engineering and control functions to ensure that financial data flows correctly between domains."

This finding underscores the necessity of structured communication frameworks, including standardized metadata catalogs, centralized documentation, and governance oversight committees, to ensure alignment across different business units.

4.8. OVERCOMING REDUNDANCY AND DATA SILOS

One of the promises of Data Mesh is reducing data silos, but some participants warned that poor implementation could lead to redundant data and inconsistencies.

The participant 3 shared an example:

"Different teams sometimes calculate the same KPI using different formulas, leading to discrepancies in reports. Strong governance mechanisms are needed to prevent duplication."

Also, participant 4 highlighted the risks of redundancy in financial reporting:

"If financial reports are generated inconsistently across domains, regulatory filings can be compromised, leading to potential legal and financial consequences."

This aligns with research suggesting that financial institutions should adopt interoperability frameworks and standardized governance protocols to prevent fragmentation in decentralized environments (Jejeel-Ojuade, 2024).

4.9. DATA AS A PRODUCT AND QUALITY ASSURANCE

The concept of treating data as a product was widely endorsed by participants, who advocated for better documentation, discoverability, and quality assurance in financial data management.

Participant 5 emphasized:

"Treating data as a product means ensuring it is well-documented, easily accessible, and meets high standards of accuracy and reliability."

Participant 1 added:

"High-quality data products improve decision-making and reduce the need for rework due to data inconsistencies."

This finding supports literature advocating for metadata-driven governance frameworks and automated data quality checks to maintain consistency in decentralized architectures (B. Dias et al., 2023; J. Soldatos & Kyriazis, 2022).

4.10. SUMMARY OF KEY FINDINGS

The table below summarizes the main insights and challenges shared by each participant:

Table 4.10 – Key Insights and Challenges Identified by Participants

Participant	Key Insights	Challenges Identified
P1	<ul style="list-style-type: none"> - Data Mesh decentralizes data ownership, reducing bottlenecks in the central team. - Business teams gain autonomy to consume data without relying on data engineering. 	<ul style="list-style-type: none"> - Lack of standardization in communication between teams leads to inconsistencies in reports. - Decentralization can create governance and data quality challenges if not well-structured.
P2	<ul style="list-style-type: none"> - Financial institutions are adopting hybrid governance models to balance autonomy and compliance. - Embedding data specialists within business units improves adaptation to regulatory requirements. 	<ul style="list-style-type: none"> - Ensuring governance consistency across decentralized teams is challenging. - Differences in KPI calculations between teams can compromise the reliability of analytics. - Business teams often lack sufficient knowledge about data security.
P3	<ul style="list-style-type: none"> - The adoption of a three-layer data architecture (Raw, Processed, Business) improves data accessibility and reliability. - Compliance with regulations (e.g., GDPR) requires strong control over sensitive data. 	<ul style="list-style-type: none"> - Communication barriers between departments cause misalignment. - KPIs may be calculated differently across teams, leading to discrepancies in reports.
P4	<ul style="list-style-type: none"> - Cloud-based ETL processes are essential for scaling financial data management. - Integrating Data Mesh principles can enhance scalability and operational efficiency in financial services. 	<ul style="list-style-type: none"> - Challenges in interoperability between different cloud providers. - Compliance with financial regulations requires high control over data traceability.

P5	<ul style="list-style-type: none"> - The use of self-service platforms improves operational efficiency and reduces dependencies on engineering teams. - Strict governance is necessary to maintain data quality and security in a decentralized environment. 	<ul style="list-style-type: none"> - Standardizing data access while maintaining team autonomy is a constant challenge. - Misalignment between teams can lead to process duplication and data inconsistencies.
----	--	--

4.11. LIMITATIONS OF THE STUDY

Despite providing valuable insights, this study has certain limitations:

1. **Sample Size:** The study included only five participants, which may not fully represent the diverse perspectives within the financial sector.
2. **Lack of Real-World Implementations:** While the interviews capture expert opinions, there are few documented real-world Data Mesh implementations in financial institutions, making it difficult to validate the findings with empirical evidence.
3. **Qualitative Nature:** The study does not include quantitative assessments or case studies, which could provide measurable insights into the effectiveness of Data Mesh in finance.
4. **Industry-Specific Challenges:** While the study focuses on finance, different financial institutions (e.g., banks, fintechs, investment firms) may face unique governance and compliance challenges, limiting the generalizability of the findings.

Future research could address these limitations by:

- Conducting longitudinal case studies on actual Data Mesh implementations in financial organizations.
- Expanding the participant pool to include regulatory bodies and financial compliance officers.
- Incorporating quantitative data to assess the effectiveness of decentralized governance models in real-world scenarios.

4.12. SUMMARY OF INTERVIEW FINDINGS

The interview findings provide a nuanced understanding of the challenges and opportunities of adopting Data Mesh in financial institutions. While the decentralized approach enhances

scalability and autonomy, governance and compliance remain major concerns. Cross-domain collaboration and redundancy management require structured governance frameworks to ensure regulatory alignment and data consistency.

The insights gained from these interviews contribute to the broader discussion on the feasibility of Data Mesh in financial institutions, reinforcing the need for hybrid governance models that balance autonomy with compliance. Future implementations must prioritize structured metadata management, automated compliance enforcement, and enhanced communication strategies to mitigate risks associated with decentralization.

4.13. INTERVIEW RESULTS OVERVIEW

This chapter presents the key findings from the interviews and discusses their implications for Data Mesh adoption in financial institutions. The results are structured around core themes that emerged from the thematic analysis, including scalability, governance and compliance, operational challenges, communication gaps, and trade-offs in implementation.

By integrating insights from expert interviews and existing literature, this discussion provides a comprehensive view of the feasibility of Data Mesh in financial institutions, considering both potential benefits and significant challenges.

4.14. SCALABILITY AND DECENTRALIZATION IN FINANCIAL DATA MANAGEMENT

Findings

Scalability is a critical challenge in financial data management. Traditional centralized architectures, such as data warehouses and data lakes, often create bottlenecks, slowing data access and limiting the ability of business teams to make timely decisions.

The Senior Data Engineer (P1) highlighted that decentralization could alleviate bottlenecks by enabling business domains to manage their own data, reducing dependencies on centralized IT teams. However, he stressed that this approach must be coupled with strong metadata management to prevent data fragmentation.

The Senior Data Analyst (P3) acknowledged that while Data Mesh improves scalability, financial institutions remain cautious about decentralization due to regulatory concerns. He argued that a hybrid model, where some aspects of data governance remain centralized, might be more practical than full decentralization.

Discussion and Industry Implications

These findings align with (Dehghani, 2021) Data Mesh framework, which advocates for domain-oriented data ownership to improve scalability. However, financial institutions face additional regulatory constraints that require greater oversight than the traditional Data Mesh model assumes.

Existing research on federated governance (Joshi et al., 2021; J. Soldatos & Kyriazis, 2022) suggests that financial organizations may benefit more from a controlled decentralization model, where operational data is decentralized but compliance and security controls remain centralized.

For financial institutions, scalability improvements must be balanced with compliance and data security. A successful approach would involve:

- Developing standardized data-sharing agreements to facilitate controlled decentralization
- Implementing scalable metadata management frameworks to ensure consistency
- Ensuring compliance oversight through automated regulatory monitoring tools

5. GOVERNANCE AND COMPLIANCE CHALLENGES

Findings

Governance and compliance emerged as the greatest challenges in Data Mesh implementation within financial institutions.

The CTO (P2) stressed that decentralized data ownership enhances efficiency but also increases the risk of regulatory non-compliance if governance models are not standardized across domains.

The Data Engineer (P4) emphasized the need for automated governance mechanisms to ensure compliance without disrupting the benefits of decentralization. He cited technologies like Apache Atlas and Open Policy Agent, which can embed governance policies within data infrastructure, enforcing regulatory rules in a decentralized manner.

Discussion and Industry Implications

These insights align with research by (Ibrahim Adedeji Adeniran et al., 2024) and (Wider et al., 2023), which highlight compliance as one of the biggest obstacles to Data Mesh adoption in finance.

The concept of federated governance, which combines centralized regulatory oversight with decentralized data management, has been proposed as a way to ensure compliance while allowing flexibility (B. Dias et al., 2023; Geisler et al., 2021).

For financial institutions, compliance failures can result in severe financial penalties and reputational damage. A well-structured governance approach should include:

- Automated compliance enforcement tools to flag violations in real time
- Standardized governance frameworks to ensure consistency across decentralized teams
- Audit mechanisms that enable compliance teams to track data lineage and monitor access history

Without these checks and balances, decentralization could increase regulatory risks, making Data Mesh adoption infeasible for financial institutions.

5.1. OPERATIONAL CHALLENGES OF IMPLEMENTING DATA MESH

Findings

All interviewees acknowledged that transitioning to Data Mesh requires significant changes in organizational structures and technical capabilities.

The Senior Data Engineer (P1) noted that most financial institutions still operate on monolithic architectures, making a shift to domain-oriented ownership complex and resource-intensive.

The Senior Data Analyst (P3) highlighted that financial teams often lack technical expertise to manage decentralized data pipelines. He suggested that self-service platforms could bridge this gap but emphasized that training and documentation would be essential for adoption.

Discussion and Industry Implications

These findings support research by (Machado et al., 2021a), which suggests that organizational readiness is key to Data Mesh adoption.

Studies on self-service data platforms (Hooshmand et al., 2022) indicate that these platforms can help business teams become more independent in data management, reducing their reliance on central IT teams.

For financial institutions, Data Mesh adoption must be accompanied by:

- Technical training programs to upskill business teams
- Self-service data platforms that balance accessibility with security
- Clearly defined responsibilities for business teams managing decentralized data

Without these foundational changes, Data Mesh adoption could fail due to operational inefficiencies.

5.2. COMMUNICATION CHALLENGES IN A DECENTRALIZED DATA STRUCTURE

Findings

Cross-team communication was a significant challenge reported by interviewees.

The Senior Data Engineer (P1) noted that misalignment in definitions, reporting standards, and governance policies could result in data inconsistencies and inefficiencies.

The CTO (P2) emphasized that decentralized models complicate cross-team collaboration, as different business domains may not always align on data structures, definitions, and access policies.

Discussion and Industry Implications

Research by (Panigrahy et al., 2023) supports these findings, emphasizing that standardized documentation and governance frameworks are necessary for successful Data Mesh adoption.

Organizations must establish:

- Data contracts to define cross-domain standards
- Shared metadata catalogs to ensure consistent data definitions
- Centralized governance oversight to mediate communication challenges

Without clear communication frameworks, financial institutions risk introducing reporting discrepancies that affect risk assessments, regulatory filings, and financial performance evaluations.

5.3. TRADE-OFFS IN IMPLEMENTATION: BALANCING AUTONOMY AND GOVERNANCE

Findings

Interviewees had differing opinions on the appropriate balance between autonomy and governance in financial institutions.

The CTO (P2) argued that while autonomy improves efficiency, it can lead to data inconsistencies if governance frameworks are not enforced.

The Data Engineer (P4) supported controlled decentralization, suggesting that institutions should allow domain teams to manage their own data pipelines while enforcing governance through metadata policies.

Discussion and Industry Implications

The findings suggest that financial institutions should not fully decentralize data ownership but instead adopt a hybrid governance model, which research supports as the most practical strategy for balancing autonomy and compliance (Joshi et al., 2021; Wider et al., 2023).

This approach ensures data autonomy for business teams while maintaining consistency, security, and regulatory oversight.

5.4. SUMMARY OF KEY INSIGHTS

Table 5.4 – Themes, Insights, and Implications for Data Mesh in Finance

Theme	Key Insight	Implication for Data Mesh in Finance
Scalability	Data Mesh reduces bottlenecks but requires strong metadata management.	A hybrid governance model may be the best approach.
Governance & Compliance	Regulatory constraints make full decentralization difficult.	Automated governance tools and federated governance models are needed.
Operational Challenges	Transitioning to Data Mesh requires technical expertise and organizational change.	Self-service platforms and training programs are critical for adoption.
Communication Challenges	Decentralized models create misalignment in data definitions and governance policies.	Standardized documentation, data contracts, and governance policies are essential.
Implementation Trade-offs	Autonomy can lead to inconsistencies if not managed properly.	Institutions should balance decentralization with standardized metadata policies.

5.5. FINAL CONSIDERATIONS

The interviews confirmed that Data Mesh has strong potential in financial institutions but requires careful planning and adaptation. Organizations must address scalability, compliance, governance, and communication challenges to ensure a successful transition.

The findings validate the theoretical model proposed in this study, supporting the idea that a controlled decentralization approach — where data teams have autonomy but follow centralized governance frameworks — is the most practical strategy for financial institutions adopting Data Mesh.

Future research could explore real-world implementations to further evaluate feasibility and outcomes.

6. IMPLICATIONS AND RECOMMENDATIONS

The findings of this study reveal both the opportunities and challenges of implementing Data Mesh in financial institutions. While decentralizing data ownership and governance can enhance scalability, efficiency, and accessibility, financial organizations must navigate complexities related to regulatory compliance, interoperability, and organizational change. This section outlines key practical implications, trade-offs, and future research directions to guide financial institutions considering Data Mesh adoption.

6.1. PRACTICAL CONSIDERATIONS FOR DATA MESH IMPLEMENTATION IN FINANCIAL INSTITUTIONS

Financial institutions seeking to implement Data Mesh should consider a structured approach that balances decentralization with governance and compliance. The following key steps can support a successful transition:

Table 6.1 – Key Steps for Implementing Data Mesh in Financial Institutions

Key Step	Description	Supporting References
Adopting a Federated Governance Model	Establish a governance framework that enables domain-level autonomy while enforcing centralized compliance through tools like Apache Atlas and Open Policy Agent.	(B. Dias et al., 2023; Wider et al., 2023)
Defining Data as a Product	Encourage each domain to treat data as a product, with clear documentation, ownership, and discoverability. Use data contracts to improve interoperability.	(Machado et al., 2021a; Panigrahy et al., 2023)
Investing in Metadata Management	Implement robust metadata frameworks to support data lineage, traceability, and	(Geisler et al., 2021; Jeleel-Ojuade, 2024)

	standardized access policies across teams.	
Developing Self-Service Data Platforms	Empower teams with tools to manage their data independently, while maintaining strict access controls and security protocols.	(Hooshmand et al., 2022; Joshi et al., 2021)
Ensuring Compliance with Regulatory Requirements	Embed compliance rules into data infrastructure and automate regulatory checks using metadata policies and AI-driven tools.	(Gatla, 2024; Ibrahim Adedeji Adeniran et al., 2024)

6.2. TRADE-OFFS IN IMPLEMENTING DATA MESH

Although the adoption of Data Mesh can enhance agility, scalability, and efficiency in financial institutions, it also introduces several strategic trade-offs that must be carefully managed. The table below summarizes key tensions encountered during implementation, along with corresponding challenges and proposed solutions supported by the literature.

Table 6.2 – Data Mesh Trade-Offs and Mitigation Strategies in Finance

Trade-Off	Challenge	Proposed Solution
Autonomy vs. Standardization	Allowing domain teams to manage their own data assets improves responsiveness and ownership but risks introducing inconsistencies in data definitions, quality standards, and compliance interpretation across the organization.	Establish a federated governance model where compliance rules and metadata standards are centrally defined but locally enforced. This hybrid approach enables autonomy while preserving consistency and auditability (Machado et al., 2021a; Wider et al., 2023).
Operational Efficiency vs. Compliance Complexity	Decentralization enhances agility by reducing reliance on centralized teams, but it complicates regulatory	Embed automated compliance checks into the infrastructure using tools like Open Policy

	compliance due to fragmented responsibilities and diverse data handling practices.	Agent or Apache Atlas. These tools can apply governance policies in real time, ensuring regulatory alignment without slowing down local operations (Ibrahim Adedeji Adeniran et al., 2024; Joshi et al., 2021).
Scalability vs. Security Risks	Scaling decentralized systems can expose financial institutions to security breaches and unauthorized access if robust access controls and data lineage are not enforced across domains.	Introduce metadata-driven access control mechanisms and standardized data-sharing agreements. These reduce exposure by controlling data access and ensuring traceability across teams and systems (Gatla, 2024; J. Soldatos & Kyriazis, 2022).

This structured view highlights the importance of deliberate architectural planning and policy enforcement when transitioning to a decentralized data model in finance. The proposed solutions reinforce the notion that hybrid governance—combining centralized oversight with localized control—offers a practical path for mitigating these trade-offs in real-world financial environments.

6.3. FUTURE RESEARCH DIRECTIONS

While this study provides valuable insights into the feasibility of Data Mesh in financial institutions, further research is required to explore its practical implementation, long-term benefits, and challenges. Future studies should focus on:

Table 6.3 – Future Research Priorities for Data Mesh in Finance

Research Focus	Description	Key References
Empirical Case Studies on Real-World Implementations	Investigate actual implementations of Data Mesh in financial institutions to understand practical challenges, benefits, and best practices.	(Krystek et al., 2023; Machado et al., 2021b)
Regulatory Adaptation of Data Mesh Governance	Explore how federated governance can evolve to meet new and changing regulatory requirements in finance.	(Geisler et al., 2021; Ibrahim Adedeji Adeniran et al., 2024)
Hybrid Governance Models for Financial Institutions	Evaluate models that combine centralized compliance enforcement with decentralized data ownership to meet regulatory demands while promoting flexibility.	(Joshi et al., 2021; Wider et al., 2023)
Role of Artificial Intelligence in Governance and Compliance	Analyze how AI can automate compliance checks, detect anomalies, and support metadata management in decentralized data systems.	(B. Dias et al., 2023; Gatla, 2024)
Quantifying the Financial Impact of Data Mesh	Measure the economic outcomes of Data Mesh adoption, including cost efficiency, regulatory compliance spending, and performance improvements.	(J. Soldatos & Kyriazis, 2022; O. White et al., 2021)

6.4. FINAL CONSIDERATIONS

The growing complexity of financial data management demands new approaches that balance scalability, compliance, and security. Data Mesh presents a promising paradigm shift, offering greater flexibility and autonomy while reducing IT bottlenecks. However, financial institutions must carefully structure their implementation strategies to mitigate governance risks and regulatory challenges.

A controlled decentralization approach, where business units manage data autonomously within a shared governance framework, appears to be the most feasible strategy for financial institutions. By adopting federated governance, self-service infrastructure, and automated compliance mechanisms, financial organizations can enhance operational efficiency, ensure regulatory adherence, and foster innovation in their data management practices.

Future research and industry collaboration will be essential to refine best practices, governance methodologies, and risk mitigation strategies for successful Data Mesh adoption in the financial sector.

7. CONCLUSION

This study examined the potential of Data Mesh to address governance, scalability, compliance, and interoperability challenges in financial institutions. Based on insights from expert interviews, the findings indicate that while decentralized data ownership can enhance data accessibility and operational efficiency, it also introduces governance and compliance complexities that must be carefully managed.

7.1. KEY FINDINGS

The study's findings highlight several critical considerations for adopting Data Mesh in financial institutions:

- **Scalability and Bottlenecks:** Traditional centralized architectures, such as data warehouses and data lakes, often create bottlenecks that limit scalability and slow decision-making (Dehghani, 2021; Machado et al., 2021b). Decentralized data ownership can improve efficiency, but financial institutions must implement strong metadata management and governance policies to prevent data fragmentation (Wider et al., 2023).
- **Governance and Compliance:** Regulatory requirements (e.g., Basel III, GDPR, open banking) impose strict oversight on financial data. While federated governance allows for more flexibility, institutions still require centralized enforcement of compliance standards (Gatla, 2024; Ibrahim Adedeji Adeniran et al., 2024).
- **Operational Challenges:** Implementing Data Mesh requires changes in organizational processes, technical infrastructure, and staff skill sets. While self-service data platforms can reduce IT dependency, teams need proper training and support to handle data independently (Machado et al., 2021a; Panigrahy et al., 2023).
- **Communication Barriers:** Decentralized structures increase the risk of misalignment in data definitions, reporting standards, and security policies across departments (Jeleel-Ojuade, 2024). To mitigate these risks, institutions must establish standardized governance frameworks and promote cross-team collaboration (J. Soldatos & Kyriazis, 2022).
- **Implementation Trade-offs:** A fully decentralized model may not be feasible for financial institutions due to compliance constraints. A hybrid approach, where business units manage their own data but follow centralized governance policies, appears to be a more practical strategy (Joshi et al., 2021; O. White et al., 2021).

These findings confirm that while Data Mesh offers clear benefits in scalability and autonomy, its successful adoption in financial institutions depends on the implementation of strong governance frameworks, compliance mechanisms, and effective communication structures.

7.2. LIMITATIONS

Despite the contributions of this study, several limitations should be acknowledged:

- **Sample Size:** The study was based on a limited number of expert interviews. A larger and more diverse sample from financial institutions would strengthen the findings (Geisler et al., 2021).
- **Absence of Real-World Implementation Data:** The research relies on theoretical analysis and expert insights, rather than studying actual Data Mesh implementations in financial institutions. Future studies should focus on real-world case studies (B. Dias et al., 2023).
- **Qualitative Focus:** The study does not include quantitative measurements of the financial impact of Data Mesh, such as cost reductions, performance improvements, or compliance efficiency. Future research should incorporate empirical data to assess these aspects (J. Soldatos & Kyriazis, 2022).

Regulatory Evolution: Financial regulations are constantly evolving. Future research should explore how Data Mesh governance frameworks can adapt to changing compliance requirements (Ibrahim Adedeji Adeniran et al., 2024).

7.3. FINAL REMARKS

This study contributes to the growing body of research on Data Mesh by analyzing its applicability in financial institutions, where governance, compliance, and security are critical concerns. While decentralization offers advantages in scalability and efficiency, it also introduces new challenges related to governance, security, and interdepartmental coordination.

A controlled decentralization model—where business units manage data autonomously but operate under a shared governance framework—appears to be the most practical approach for financial institutions. Future research should continue to explore real-world adoption strategies, governance methodologies, and financial implications to refine the implementation of Data Mesh in highly regulated environments.

8. BIBLIOGRAPHICAL REFERENCES

- Dias, B., Kaenprakhamroy, J., Gorricho, J., Salk, M., Iyer, N., Tabit, D., & Joshi, K. (2023). *Data Interoperability's Importance in the Financial Services Industry*. https://www.moody's.com/web/en/us/hosted-assets/MA_DS_Data-Interoperability-FinSvc-Report.pdf
- Dehghani, Z. (2021). *Data Mesh Delivering Data-Driven Value at Scale*. O'Reilly Media.
- Falconi, M., & Plebani, P. (2023). Adopting Data Mesh principles to Boost Data Sharing for Clinical Trials. *Proceedings - 2023 IEEE International Conference on Digital Health, ICDH 2023*, 298–306. <https://doi.org/10.1109/ICDH60066.2023.00051>
- Frischbier, S., Paic, M., Echler, A., & Roth, C. (2020). *Managing the Complexity of Processing Financial Data at Scale -- an Experience Report*. https://doi.org/10.1007/978-3-030-34843-4_2
- Gaddam, B. K. (2024). Data Warehousing Architecture and Implementation for Enhanced Financial Reporting: A Systematic Review. *International Journal of Computer Engineering and Technology*, 15(6), 751–759. <https://doi.org/10.5281/zenodo.14228481>
- Geisler, S., Vidal, M.-E., Cappiello, C., Lóscio, B. F., Gal, A., Jarke, M., Lenzerini, M., Missier, P., Otto, B., Paja, E., Pernici, B., & Rehof, J. (2021). *Knowledge-driven Data Ecosystems Towards Data Transparency*. <http://arxiv.org/abs/2105.09312>
- Hooshmand, Y., Resch, J., Wischnewski, P., & Patil, P. (2022). From a Monolithic PLM Landscape to a Federated Domain and Data Mesh. *Proceedings of the Design Society*, 2, 713–722. <https://doi.org/10.1017/pds.2022.73>
- Ibrahim Adedeji Adeniran, Angela Omozele Abhulimen, Anwuli Nkemchor Obiki-Osafiele, Olajide Soji Osundare, Edith Ebele Agu, & Christianah Pelumi Efunniyi. (2024). Strategic risk management in financial institutions: Ensuring robust regulatory compliance. *Finance & Accounting Research Journal*, 6(8), 1582–1596. <https://doi.org/10.51594/farj.v6i8.1508>
- Jeleel-Ojuade, A. (2024). *The Role of Information Silos: An analysis of how the categorization of information creates silos within financial institutions, hindering effective communication and decision-making*.
- Joshi, D., Pratik, S., & Rao, M. P. (2021). *Data Governance in Data Mesh Infrastructures: The Saxo Bank Case Study*. 599–604. <https://aisel.aisnet.org/iceb2021/52/>
- Krystek, M., Morzy, M., Mazurek, C., & Pukacki, J. (2023). *Introducing Data Mesh paradigm for Smart City platforms design*. 6885–6892. <https://hdl.handle.net/10125/103468>

- Machado, I. A., Costa, C., & Santos, M. Y. (2021a). Data Mesh: Concepts and Principles of a Paradigm Shift in Data Architectures. *Procedia Computer Science*, 196, 263–271. <https://doi.org/10.1016/j.procs.2021.12.013>
- Machado, I. A., Costa, C., & Santos, M. Y. (2021b). *Data-Driven Information Systems: The Data Mesh Paradigm Shift*. <https://aisel.aisnet.org/isd2014/proceedings2021/currenttopics/9/>
- Panigrahy, S., Dash, B., & Thatikonda, R. (2023). From Data Mess to Data Mesh: Solution for Futuristic Self-Serve Platforms. *IJARCCCE*, 12(4). <https://doi.org/10.17148/ijarccce.2023.124121>
- Gatla, T. (2024). AI-driven regulatory compliance for financial institutions: Examining how AI can assist in monitoring and complying with ever-changing financial regulations. In *International Journal of Creative Research Thoughts* (Vol. 12). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4856649
- Soldatos, J., & Kyriazis, D. (2022). Big Data and Artificial Intelligence in Digital Finance. In *Big Data and Artificial Intelligence in Digital Finance*. Springer International Publishing. <https://doi.org/10.1007/978-3-030-94590-9>
- White, O., Madgavkar, A., Townsend, Z., Manyika, J., Olanrewaju, T., Sibanda, T., & Kaufman, S. (2021). *Financial data unbound: The value of open data for individuals and ins.* <https://www.mckinsey.com/industries/financial-services/our-insights/financial-data-unbound-the-value-of-open-data-for-individuals-and-institutions>
- Wider, A., Verma, S., & Akhtar, A. (2023). *Decentralized Data Governance as Part of a Data Mesh Platform: Concepts and Approaches*. <https://doi.org/https://ieeexplore.ieee.org/document/10248262>

9. APPENDIX



This is to certify that

Project No.: **DSCI2025-4-69489**

Project Title: **Revolutionizing Data Management in the Financial Sector: A Data Mesh Approach to Governance, Compliance, and Scalability**

Principal Researcher: **Pedro Henrique Cabral Adonis**

according to the regulations of the Ethics Committee of NOVA IMS and MagIC Research Center this project was considered to meet the requirements of the NOVA IMS Internal Review Board, being considered **APPROVED** on 4/6/2025.

It is the Principal Researcher's responsibility to ensure that all researchers and stakeholders associated with this project are aware of the conditions of approval and which documents have been approved.

The Principal Researcher is required to notify the Ethics Committee, via amendment or progress report, of

- Any significant change to the project and the reason for that change;
- Any unforeseen events or unexpected developments that merit notification;
- The inability of the Principal Researcher to continue in that role or any other change in research personnel involved in the project.

Lisbon, 4/6/2025

NOVA IMS Ethics Committee
ethicscommittee@novaims.unl.pt

Appendix A – Ethics Committee Approval Certificate



NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação

Universidade Nova de Lisboa