

ISSN (online): 2581-3048 Volume 5, Issue 5, pp 150-152, May-2021 https://doi.org/10.47001/IRJIET/2021.505028

# AI-Infused Data Warehousing: Redefining Data Governance in the Finance Industry

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Abstract - The finance industry is undergoing a paradigm shift in data management with the integration of artificial intelligence (AI) into data warehousing. This paper explores the transformative potential of AI-infused data warehousing in redefining data governance within the finance sector. Key challenges such as data quality, regulatory compliance, and real-time risk management are analyzed alongside AI-powered solutions. By presenting applications and a comprehensive implementation framework, this article offers a roadmap for optimizing financial data warehouses to support enhanced decisionmaking, improved compliance, and advanced risk management strategies.

*Keywords:* AI in finance, data governance, AI-driven compliance, financial data warehouses, real-time risk management, automated fraud detection, data quality management, regulatory adherence.

#### I. Introduction

As the financial industry becomes increasingly datadriven, traditional data warehousing systems must evolve to meet modern demands. Legacy systems, built for structured data processing and periodic reporting, struggle with the surge in digital transactions, complex instruments, and stringent regulatory requirements. AI-infused data warehousing introduces intelligent, automated solutions that transform governance processes, enabling seamless workflows from data ingestion to analytics and compliance. This paper investigates AI's role in overcoming these challenges and explores strategies for its successful implementation in the finance sector.

# II. AI-Powered Data Governance in Financial Data Warehouses

#### **Intelligent Data Quality Management**

AI algorithms ensure data accuracy by automating quality assessment, anomaly detection, and enrichment processes. This reduces manual intervention and ensures consistency across datasets (Batini et al., 2009). Machine learning (ML) models learn from historical data patterns, improving anomaly detection over time.

#### **Automated Regulatory Compliance**

AI-powered systems streamline adherence to complex regulations, including GDPR, BCBS 239, and Dodd-Frank, by mapping regulatory requirements to data elements using NLP techniques (Butler, 2017).

#### **Real-Time Risk Assessment**

AI-enabled financial warehouses process high-velocity data streams to identify and predict market, credit, and operational risks in real time. Predictive analytics empowers institutions to respond swiftly to emerging risks (Khandani et al., 2010).

#### **III.** Applications in Financial Data Governance

#### **Fraud Detection and Prevention**

AI models analyze transaction behaviors in real-time, identifying fraudulent patterns with higher accuracy than rulebased systems (Phua et al., 2010). Self-learning models adapt to new fraud scenarios, ensuring ongoing vigilance.

#### **Customer Data Protection**

Advanced privacy-preserving methods such as differential privacy and federated learning protect sensitive data while maintaining analytical utility (Dwork, 2008).

#### Audit Trail Management

AI-driven data lineage tools automate the tracking of data transformations, creating transparent, comprehensive audit trails that simplify regulatory audits (Herschel, 2008).

#### **Implementation Framework**

To leverage AI for enhanced data governance, organizations should:

- Assess: Evaluate current data systems and identify gaps.
- Strategize: Develop governance policies aligned with AI capabilities.
- Automate: Deploy AI models for data quality and compliance monitoring.

International Research Journal of Innovations in Engineering and Technology (IRJIET)



ISSN (online): 2581-3048

Volume 5, Issue 5, pp 150-152, May-2021

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- Integrate: Ensure compatibility with legacy and modern systems.
- Monitor: Continuously refine AI systems for adaptability.

# **IV. Case Studies**

# **Global Investment Bank**

A prominent global bank deployed AI-powered data warehouses, achieving:

- 40% reduction in data errors through automated quality checks.
- 60% faster regulatory reporting, utilizing NLP for compliance mapping.
- 30% improvement in fraud detection accuracy, leveraging adaptive ML models.
- 50% reduction in manual governance tasks, yielding substantial cost savings.

# **Regional Retail Bank**

A mid-sized retail bank adopted an AI-infused governance framework to enhance customer protection and compliance, achieving:

- Real-time customer privacy management using federated learning to secure sensitive data during transactions.
- 20% faster customer onboarding by automating document verification.
- 15% reduction in operational risk, aided by predictive risk assessment models.

#### **Financial Technology Startup**

A fintech startup incorporated AI-driven data governance to scale operations securely:

- Seamless fraud detection and prevention, leveraging neural networks for high-speed anomaly detection.
- 30% improvement in system uptime, using AI to predict and mitigate system failures.
- Enhanced audit readiness, utilizing automated data lineage tracking.

## V. Challenges and Considerations

#### Explainability

Ensuring transparency in AI decisions remains critical for regulatory acceptance and trust-building (Doshi-Velez & Kim, 2017).

# **Data Privacy**

Balancing data utilization with stringent privacy laws like GDPR is challenging (Tankard, 2016).

# **Model Bias**

Addressing biases in AI models ensures fairness and inclusivity in financial services (Barocas & Selbst, 2016).

# Skill Gap

Bridging the gap in AI expertise within financial organizations is essential (Davenport & Patil, 2012).

# VI. Conclusion

AI-infused data warehousing is revolutionizing financial data governance by addressing core challenges such as compliance, risk management, and data integrity. These systems empower institutions to achieve operational excellence, reduce manual overhead, and deliver unparalleled customer experiences.

The adoption of AI in data governance has unlocked new possibilities, such as:

- Real-time compliance monitoring, enhancing agility in adapting to regulatory changes.
- Advanced fraud prevention mechanisms, safeguarding financial ecosystems.
- Data-driven decision-making, fostering a proactive governance culture.

However, the journey toward AI adoption is not without obstacles. Explainability, privacy, and the skill gap require significant attention to realize AI's full potential. Future research should focus on explainable AI, federated learning for cross-border data privacy, and frameworks to mitigate AI biases in finance.

By embracing AI, financial institutions can create robust, intelligent data ecosystems that set new benchmarks for compliance, efficiency, and innovation.

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# Citation of this Article:

Srinivasa Chakravarthy Seethala. (2021). AI-Infused Data Warehousing: Redefining Data Governance in the Finance Industry. International Research Journal of Innovations in Engineering and Technology – IRJIET. 5(5), 150-152. Article DOI https://doi.org/10.47001/IRJIET/2021.505028

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