

---

| RESEARCH ARTICLE

## Transaction Data Distribution and Reuse: Architectural Paradigms for Enterprise Systems Integration

**Bramhanand Lingala**

*Sri Krishnadevaraya University, India*

**Corresponding Author:** Bramhanand Lingala, **E-mail:** [bramhanand.lingala11@gmail.com](mailto:bramhanand.lingala11@gmail.com)

---

| ABSTRACT

The spread of digital business processes produces vast amounts of transaction data in the enterprise ecosystem. It extends beyond its primary captain reference, offering valuable resource decision making, customer engagement, and transforming capacity for operational efficiency. Distribution and reuse of transaction data effectively presents versatile challenges that deliberately require architectural approaches. Organizations should balance competitive preferences, including legacy requirements, stability guarantees, integration complexity, and governance mandates. Through the investigation of the architectural model, along with the implementation of change data captures, event streaming, API-based distribution, data lake integration, and class use cases, a comprehensive structure emerges to direct the enterprise's data distribution strategies. Strategic implementation of the appropriate distribution system provides adequate business benefits, including increased customer experiences, better operating capacity, and quicker decision cycles. A strong governance structure incorporating schema management, access control, data protection, descent tracking, and quality assurance provides a foundation for permanent transaction data distribution that balances utility with safety and compliance. Development towards real-time transaction data uses represents an important competitive discrimination in today's digital marketplace, in which leading organizations improve customer retention, fraud detection, supply chain optimization, and average improvement in market accountability. Despite technological progress, the organizational challenges of skill development, heritage system integration, and process change often offer more obstacles than technical implementation. Along with technical architectural decisions, addressing these human and procedural dimensions is necessary to realize the complete capacity of transactional data assets.

| KEYWORDS

Transaction data distribution, enterprise architecture, data governance, real-time analytics, change data capture, event streaming

| ARTICLE INFORMATION

**ACCEPTED:** 01 August 2025

**PUBLISHED:** 03 September 2025

**DOI:** 10.32996/jcsts.2025.7.9.34

---

### 1. Introduction

The transaction data forms the basic substrate of the contemporary digital ecosystem, including important commercial interactions such as financial transfer, procurement phenomena, and service booking. Recent industry analysis suggests that 89% of organizations now consider data to be important for commercial success, with 68% of enterprises, their transaction system [1] has more than 100,000 incidents per second. The strategic value of this data is much higher than its primary reference, which offers cross-functional applications in the entire enterprise environment. Organizations recognize rapid transaction data as a strategic property that is capable of increasing decision-making processes, customer engagement initiatives, and operational efficiency metrics when business intelligence platforms, machine learning systems, and operating dashboards are properly distributed.

The distribution of transactions and subsequent reuse requires careful architectural ideas. The transaction system traditionally prefers performance and stability for its primary functions, often at the cost of analytical access. Industry benchmarks indicate

**Copyright:** © 2025 the Author(s). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) 4.0 license (<https://creativecommons.org/licenses/by/4.0/>). Published by Al-Kindi Centre for Research and Development, London, United Kingdom.

that while 84% of organizations recognize real-time data as necessary, only 23% report being completely satisfied with their current real-time data abilities, highlighting a significant implementation interval [1]. Meanwhile, the consumption system displays various requirements about data freshness, format, and access patterns. Therefore, contemporary enterprises should establish sophisticated data distribution mechanisms that balance competitive preferences, including system performance, data stability, integration flexibility, and regulatory compliance.

This article examines architectural models for efficient transaction data distribution, analyzes implementation considerations across diverse enterprise use cases, and proposes a comprehensive framework for evaluation and deployment. The implementation of modern distribution architectures has demonstrated substantial business impact, with organizations reporting that real-time data utilization enhances customer experience (identified by 61% of respondents), improves operational efficiency (57%), and enables faster decision-making (52%) [1]. The research synthesizes current industry practices with emerging technological capabilities to provide organizations with actionable insights for maximizing the utility of their transaction data assets.

The evolution of transaction data distribution approaches has accelerated dramatically, yet significant maturity gaps persist across data management dimensions. According to the EDM Council's Global Data Management Benchmark, organizations score just 3.1 out of 6.0 in data architecture maturity, with particularly low scores in areas critical to transaction data distribution, such as data integration (2.9) and technology architecture (3.2) [2]. These challenges are compounded by governance requirements, where regulatory compliance (3.3) and control environment (3.4) dimensions reveal substantial room for improvement [2]. The data further indicates that only 20% of organizations have reached the "defined" stage of data management maturity, while merely 5% have achieved "managed" status [2], underscoring the nascent state of enterprise transaction data distribution capabilities despite their strategic importance.

## 2. Critical Challenges in Transaction Data Distribution

The distribution of transaction data across enterprise ecosystems presents several intricate challenges that must be addressed through architectural design decisions:

### Latency and Data Freshness

Consumer systems exhibit varying temporal requirements, from real-time fraud detection systems demanding sub-second access to analytical platforms that may tolerate hourly or daily updates. Industry analysis indicates that 63% of organizations cite speed and real-time requirements as their primary data integration challenge, with performance concerns serving as the top obstacle for data processing teams [3]. Distribution mechanisms must provide appropriate freshness guarantees without imposing excessive load on source transactional systems. Research shows that 82% of enterprises rely on batch processing for transaction data integration, despite 71% identifying the need for more real-time capabilities, highlighting a significant gap between current practices and business requirements [3]. The operational impact of excessive query load on primary transaction databases can compromise core business functions, necessitating careful extraction strategies. Organizations implementing purpose-built integration tools report 4.2x faster data delivery compared to custom-built solutions, while reducing operational overhead by 68% [3].

### Data Consistency Management

Transaction data often maintains ACID properties within its originating system. However, when distributed across multiple platforms, maintaining absolute consistency becomes increasingly complex. Data governance benchmarks reveal that only 25% of organizations report having mature processes for measuring and monitoring data quality, while 62% acknowledge data quality concerns when replicating transaction data [4]. Architectural decisions must establish acceptable consistency guarantees, ranging from strict consistency for financial applications to eventual consistency for analytical workloads. Financial institutions report spending 37% of their data management budget on consistency verification mechanisms, significantly higher than other sectors [4]. The chosen approach must balance consistency requirements against performance and availability considerations. Organizations with established data quality management frameworks report 43% fewer reconciliation issues and 51% faster issue resolution compared to those without structured approaches [4].

### Integration Complexity Factors

Enterprise environments typically incorporate diverse technological ecosystems with heterogeneous data format requirements, communication protocols, and processing paradigms. Research indicates that organizations utilize an average of 4-7 different data integration tools, with 46% of data teams spending more than half their time on integration tasks rather than extracting business value [3]. Distribution mechanisms must accommodate these differences through appropriate transformation, protocol adaptation, and integration patterns. The technological diversity present in enterprise environments necessitates flexible

approaches to schema evolution and version management. Organizations implementing comprehensive metadata management report a 56% reduction in integration-related incidents and a 37% faster time-to-value for new data initiatives [3].

Governance and Security Requirements

Transaction data frequently contains sensitive information subject to regulatory constraints and privacy considerations. Governance research indicates that 59% of board members now identify data privacy and security as their top data concern, with 83% of organizations reporting increased regulatory scrutiny of data practices [4]. Distribution architecture should include strong security mechanisms, including certification, authority, encryption, and data masking. Organizations with mature data governance programs report 47% lower security incidents and 32 32% higher regulatory compliance rating compared to the industry. In addition, the outline of the comprehensive governance must establish clear data ownership, lineage tracking, and audit capabilities for compliance with regulatory mandates such as GDPR, CCPA, or industry-specific requirements. Despite the significant importance of governance, only 28% of the organizations have operated their data governance framework perfectly, which has created significant risk [4].

Challenge/Requirement	Metric
Organizations citing speed/real-time requirements as the primary challenge	63%
Enterprises relying on batch processing despite real-time needs	82%
Performance improvement with purpose-built integration tools	4.2x faster
Operational overhead reduction with purpose-built tools	68%
Data teams spending >50% time on integration vs. value extraction	46%
Organizations with mature data quality measurement processes	25%
Financial institution budget allocation for consistency verification	37%
Board members identifying data privacy/security as top concern	59%
Organizations reporting increased regulatory scrutiny	83%
Organizations with fully operationalized governance frameworks	28%

Table 1: Integration Challenges and Governance Requirements [3,4]

3. Architectural Models for Enterprise Data Distribution

Contemporary enterprise architectures employ several distinct approaches to transaction data distribution, each offering specific advantages for particular use cases:

Change Data Capture (CDC) Mechanisms

CDC technologies such as Debezium, Oracle GoldenGate, and AWS Database Migration Service (DMS) operate by monitoring database transaction logs to identify modifications. According to Salesforce documentation, CDC delivers approximately 59 million change events daily across its ecosystem, with events being delivered within 5 seconds of database commits for 98% of transactions [5]. This non-invasive approach extracts changes with minimal impact on source systems, enabling low-latency propagation to consuming applications. CDC excels in scenarios requiring near real-time data access without modifying existing transaction processing systems. Salesforce CDC implementations support high-volume transaction environments by limiting standard channels to 100,000 events per day and custom channels scaling up to 250,000 events per 24-hour period [5]. Event monitoring demonstrates that CDC mechanisms can process updates across millions of records while maintaining an average end-to-end latency under 10 seconds, even during peak operational periods. Salesforce CDC adoption has increased 72% year-over-year, with financial services and healthcare sectors reporting the highest implementation rates at 43% and 38% respectively [5].

Event Streaming Platforms

Distributed streaming platforms, including Apache Kafka and Apache Pulsar, facilitate event-driven architectures where transactions are modeled as immutable events published to topics. Industry benchmarks demonstrate that modern streaming

platforms can handle millions of events per second with sub-millisecond p99 latencies, with Redpanda achieving 82% lower tail latencies compared to Apache Kafka in equivalent configurations [6]. This approach enables decoupled, parallel processing by multiple consumers operating at their own pace. Event streaming architectures provide excellent scalability characteristics and support for diverse consumption patterns, from real-time processing to retrospective analysis. Research indicates that organizations implementing modern event streaming platforms reduce infrastructure requirements by up to 60% while supporting 3-5x higher throughput with the same hardware footprint [6]. The persistent nature of event logs creates an authoritative audit trail and enables replay capabilities for new consumers or recovery scenarios. Performance testing demonstrates that leading platforms can maintain 65TB+ of data while supporting thousands of concurrent topics and achieving 99.99% availability [6].

#### API-Based Distribution Frameworks

Resist, GraphQL, or GRPC protocols provide controlled, standardized access to transaction data using the protocol. This approach offers fine access controls and transformation capabilities by encountering the underlying data structures. API-based delivery excels in the scenarios required by a careful regime, version, and integration with external partners. The implementation of API management platforms facilitates developers' onboarding and provides usage and modification opportunities.

#### Data Lake and Warehouse Integration

Transactions in batch and micro-batch processing pipelines are transported to a centralized repository, such as data lakes or cloud data warehouses. This approach supports extensive historical analysis, complex aggregation, and integrated ideas in many data domains. Modern ELT functioning takes advantage of the computational capabilities of these platforms to change the data after landing, increase flexibility, and reduce upstream processing requirements.

Architecture	Metric	Value
CDC	Daily change events in the Salesforce ecosystem	~59 million
	Events delivered within 5 seconds of commit	98%
	Standard channel event limit per day	1,00,000
	Custom channel scaling capacity per 24-hour period	Up to 250,000
	Year-over-year adoption increase	72%
Event Streaming	Events processed per second	Millions
	Latency performance (p99)	Sub-millisecond
	Tail latency improvement (Redpanda vs. Kafka)	82% lower
	Infrastructure requirement reduction	Up to 60%
	Availability level achieved	99.99%

Table 2: Architectural Approaches Performance Comparison [5,6]

#### 4. Implementation Considerations for Enterprise Use Cases

The effective implementation of transaction data distribution requires careful alignment with specific enterprise use cases:

Business intelligence and analytical

BI platforms require relevant data collected to support decision-making processes through dashboards, reports, and ad hoc analysis. According to Decision Foundry research, organizations implementing performance benchmarks in their BI strategies experience 38% higher ROI on analytics investments compared to those without structured measurement frameworks [7]. Implementation considerations include balancing data freshness against transformation complexity and ensuring appropriate historical retention. Companies using dashboard benchmarking report that metrics visibility drives 31% improvement in operational KPIs and 27% faster identification of market opportunities [7]. The optimal implementation approach focuses on measuring current state performance, with 76% of successful BI implementations establishing clear baseline metrics before implementation and 83% defining specific, measurable goals for dashboard utilization rates, query performance, and business impact metrics [7]. Organizations adopting comprehensive benchmarking frameworks report 67% higher user adoption rates and 42% greater executive confidence in data-driven decisions [7].

Machine Learning Applications

ML systems leverage transaction data for predictive modeling across domains, including fraud detection, churn prediction, and recommendation engines. According to McKinsey research, organizations implementing ML-driven transaction analysis can expect a 30-50% reduction in costs and 50-100% improvement in operational efficiency compared to traditional rule-based approaches [8]. Effective implementations must support both batch training on historical data and real-time inference against current transactions. Leading organizations systematically maintain 20+ key business metrics directly linked to ML model performance, enabling quantifiable business impact measurement [8]. Data quality, feature consistency, and proper handling of temporal aspects emerge as critical success factors. By 2025, industry analysis projects that 70% of organizations will shift from pilot ML projects to systematically hardened production deployments with clear business value realization [8].

Customer Experience Personalization

CRM and marketing automation platforms use transactions to create individual customer experiences through platform division, targeting, and interaction orchestration. Implementation success depends on low-latency access to the current customer context combined with historical behavioral patterns. Research indicates that the best-in-class organizations deploying advanced analytics for customer experience get a 15-20% decrease in customer churning and a 10–20% increase in sales conversion rates [8]. Privacy ideas require consent management and careful implementation of data minimization practices, especially in courts with a stringent regulatory framework. Forward-looking outfits are incorporating differential privacy techniques that maintain analytics utility by providing a mathematical guarantee of personal privacy protection [8].

Regulatory Compliance and Auditing

Financial services and healthcare organizations face stringent requirements for transaction auditability and compliance reporting. Implementations must ensure complete, immutable record-keeping with appropriate retention policies and access controls. Performance benchmarking data indicates that organizations implementing automated compliance monitoring report a 43% reduction in audit preparation time and a 57% decrease in compliance-related findings [7]. The adoption of append-only architectures with cryptographic verification provides tamper-evident audit trails that satisfy regulatory scrutiny while supporting efficient compliance reporting. By 2025, McKinsey projects that 60% of enterprises will implement continuous monitoring and compliance systems that dramatically reduce manual auditing efforts while improving risk management coverage [8].

Business Domain	Impact Metric	Value
Business Intelligence	ROI improvement with performance benchmarking	38% higher
	Operational KPI improvement through metrics visibility	31%
	User adoption rate improvement with benchmarking	67% higher
	Executive confidence in data-driven decisions	42% greater
Machine Learning	Cost reduction with ML-driven transaction analysis	30-50%

	Operational efficiency improvement	50-100%
Customer Experience	Customer churn reduction with advanced analytics	15-20%
	Sales conversion rate increases	10-20%
Compliance	Organizations implementing continuous monitoring by 2025	60%

Table 4: Business Impact of Transaction Data Implementation [7,8]

## 5. Data Governance Framework for Distributed Transaction Data

Effective transaction data distribution necessitates robust governance frameworks to ensure appropriate usage, maintain quality, and enforce security requirements:

### Schema Evolution Management

As the transaction system develops, changes in data structures should be constantly propagated in the distribution ecosystem. According to Fortune Business Insights, the global data governance market is estimated to increase from 3.53 billion in 2023 to 2030 by 2030 to increase to USD 13.67 billion, at a CAGR of 21.4%, highlighting increasing organizational investment in structured governance approaches [9]. The implementation of schemes with compatibility verification mechanisms prevents breaking changes and ensures the difference between producers and consumers. Forward and backward compatibility strategies allow phased migrations without system-wide synchronization requirements. The BFSI sector currently dominates data governance adoption with a 25.8% market share, driven by stringent regulatory requirements and the criticality of transaction data integrity [9].

### Access Control and Authorization

The granular permission model should reflect organizational roles and responsibilities, supporting the principle of minimal privileges. Implementation approaches include characteristic-based access control (ABAC) for complex authority requirements and integration with enterprise identification providers for centralized authentication. Sensitivity classification frameworks help systematize protection measures based on data characteristics. North America leads global governance adoption with a 37.8% market share, with financial services organizations reporting 42% higher compliance ratings following implementation of comprehensive authorization frameworks [9].

### Data Protection Implementation

Sensitive transaction elements require protection through techniques including tokenization, partial masking, and encryption. According to the Data Intelligence Index, data protection capabilities represent 22.7% of the overall data intelligence market valuation, underscoring their critical importance in governance frameworks [10]. Field-level security implementations allow differentiated protection based on data sensitivity and user authorization. De-identification approaches such as k-anonymity and differential privacy techniques support cases of analytical use, preserving personal privacy. Companies in the Data Intelligence Index exhibit 23.4% annual revenue growth compared to 13.2% for benchmark indices, demonstrating the financial impact of mature data protection practices [10].

### Lineage and Provenance Tracking

Complete documentation of data origins and transformations supports regulatory compliance, troubleshooting, and impact analysis. According to industry benchmarks, organizations implementing automated lineage capabilities experience 47% faster impact assessment for regulatory changes and 56% reduction in audit preparation effort [9]. Automated lineage capture through metadata management platforms reduces documentation burden while improving accuracy. Graph-based lineage representations facilitate intuitive visualization and navigation of complex data relationships. The Data Intelligence Index shows that organizations with mature metadata management capabilities achieve 17.8% higher profit margins compared to industry averages, highlighting the business value of comprehensive lineage tracking [10].

### Data Quality Management

Transaction data distribution should include quality verification to prevent the spread of errors. The implementation approach includes automatic verification rules, detection of statistical discrepancies, and reconciliation processes. Quality metrics should address dimensions including perfection, accuracy, stability, and timeliness. Companies represented in the Data Intelligence

Index display 39.1% more returns on assets than the broader technology sector, in which data quality management capabilities are identified as the primary driver of this performance difference [10]. The healthcare sector is experiencing the fastest governance adoption growth at 22.7% CAGR, with quality management for transaction data cited as the top implementation priority by 68% of healthcare organizations [9].

Category	Metric	Value
Market Trends	Global data governance market size (2023)	USD 3.53 billion
	Projected market size by 2030	USD 13.67 billion
	Compound Annual Growth Rate (CAGR)	21.40%
	BFSI sector market share	25.80%
	Healthcare sector governance adoption CAGR	22.70%
Financial Benefits	Data protection share of the intelligence market	22.70%
	Annual revenue growth of Data Intelligence Index companies	23.40%
	Benchmark indices' annual revenue growth	13.20%
	Profit margin improvement with mature metadata management	17.8% higher
	Return on assets compared to the broader technology sector	39.1% higher

Table 4: Data Governance Market Trends and Protection Benefits [9,10]

## Conclusion

The strategic distribution and re-use of transactions represents an important potential for modern enterprises that receive competitive benefits through data-operated operations. The architectural model investigated- CDC, event streaming, API-based framework, and data lake integration- provides different benefits that can be added to hybrid approaches to suit specific organizational requirements. Successful implementation aligns the distribution mechanisms with careful enterprise use cases, ensuring proper delay, stability, and access characteristics for each consumer system. The implementation of a comprehensive governance structure provides the foundation for permanent data distribution by ensuring proper skima development, access control, data security, lineage tracking, and quality management. Since transaction data volumes grow rapidly, organizations establishing mature distribution capabilities will be deployed to extract maximum value from these assets while maintaining safety, compliance, and performance. Through the thoughtful architectural design and governance implementation, enterprise transactions can transform data into strategic assets from operating sub-products that increase decision making, customer experiences, and operational excellence. Traveling towards effective transactions data distribution requires data engineering, application development and organizational silos between professional domains. Cross-structure cooperation enables data semantics, quality requirements, and the overall understanding of the commercial references required for re-use. Future progress in AI-operated data distribution will further adapt to routing decisions, skima changes, and quality assurance procedures to reduce manual intervention by improving data accessibility. Edge Computing Architecture will push the rapid transaction data processing capabilities close to data generation points, which will enable localized decisions to be made while maintaining centralized governance. Organizations that adopt a flexible, composable data distribution architecture will maintain competitive agility as new techniques emerge, which avoids lock-in from harsh perspectives that limit future innovation capacity. The strategic importance of transaction data will continue to accelerate as a digital change initiative, which makes strong distribution capabilities in industries an essential basis for enterprise data strategies.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The authors declare no conflict of interest.

**Publisher's Note:** All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

## References

- [1] ImPLY, "2024 Data Streaming Report," 2024. [Online]. Available: <https://imply.io/wp-content/uploads/2024/09/2024-data-streaming-report.pdf>
- [2] EDM Council, "2020 Global Data Management Benchmark Report," 2020. [Online]. Available: <https://edmcouncil.org/wp-content/uploads/2023/01/EDM-Council-2020-Global-Data-Management-Benchmark-Report-FINAL-v2.2.pdf>
- [3] Nexla, "Data Integration Tools—How to Choose the Best One?". [Online]. Available: <https://nexla.com/data-integration-techniques/data-integration-tools/>
- [4] Enterprise Data Strategy Board, "2025 State of Enterprise Data Governance," Available: <https://go.board.org/data-governance-report>
- [5] Salesforce, "Change Data Capture," [Online]. Available: [https://developer.salesforce.com/docs/atlas.en-us.change\\_data\\_capture.meta/change\\_data\\_capture/cdc\\_intro.htm](https://developer.salesforce.com/docs/atlas.en-us.change_data_capture.meta/change_data_capture/cdc_intro.htm)
- [6] Redpanda, "Event Stream Platform- an introduction,". [Online]. Available: <https://www.redpanda.com/guides/event-stream-processing-event-streaming-platform>
- [7] Decision Foundry, "Using Performance Benchmarks for Business Intelligence Strategies," 2024. [Online]. Available: <https://www.decisionfoundry.com/business-intelligence-consulting/articles/using-performance-benchmarks-for-business-intelligence-strategies/>
- [8] Neil Assur and Kayvaun Rowshankish, "The Data-Driven Enterprise of 2025," 2022. [Online]. Available: <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-data-driven-enterprise-of-2025>
- [9] Fortune Business Insights, "Data Governance Market Size, Share & Industry Analysis, By Deployment (On-premise and Cloud), By Application (Audit Management, Incident Management, Compliance Management, and Risk Management), By Industry (BFSI, Healthcare, Government, Retail & Consumer Goods, IT & Telecom, and Others), and Regional Forecast, 2025 – 2032," 2025. [Online]. Available: <https://www.fortunebusinessinsights.com/data-governance-market-108640>
- [10] Michael Haupt, "Data Intelligence Index," Vontobel, 2023. [Online]. Available: [https://www.vontobel.com/siteassets/financial-intermediaries/structured-investments/data-intelligence/20231003\\_data-intelligence-index\\_en.pdf](https://www.vontobel.com/siteassets/financial-intermediaries/structured-investments/data-intelligence/20231003_data-intelligence-index_en.pdf)