From The Center To The Periphery: Navigating The Shift Toward Decentralized Data

Data Decentralization Results From The March 2024 Thought Leadership Paper, "The Path To Operational Resilience Begins With Reliability and Risk Management"

Executive Summary

Financial services and insurance (FSI) institutions are limited by centralized data architectures in meeting data consumers' increasing demands. Once the cornerstone of FSI firms' data strategy, these architectures are increasingly strained by the growing scale and complexity of data sources and requests as they often lead to bottlenecks, single points of failure, and challenges in maintaining data quality and context.

Data decentralization is a viable alternative for FSI decision-makers to distribute data ownership and management across various domains. This approach addresses the inefficiencies of centralized models and promotes data democratization, which enables wider access to data and fosters a data-driven culture. Embracing multiple sources of truth and implementing decentralized architectures can improve data accessibility, quality, and compliance. Additionally, developing a holistic strategy that ensures their organization can effectively adapt to the new paradigm of data decentralization can enable FSI decision-makers to drive innovation and enhance competitive advantage at their organization.

In September 2023, Red Hat and Intel commissioned Forrester Consulting to explore the role of data decentralization in the FSI industry in APAC. Forrester conducted an online survey with 330 business decision-makers responsible for the strategy, design, and delivery of their organization's key services, as well as 214 tech professionals responsible for their organization's strategies on data infrastructure, data management, data analytics, and IT security and risk. This study will explore the challenges that FSI firms in APAC face in meeting the needs of their data consumers and how data decentralization addresses them.
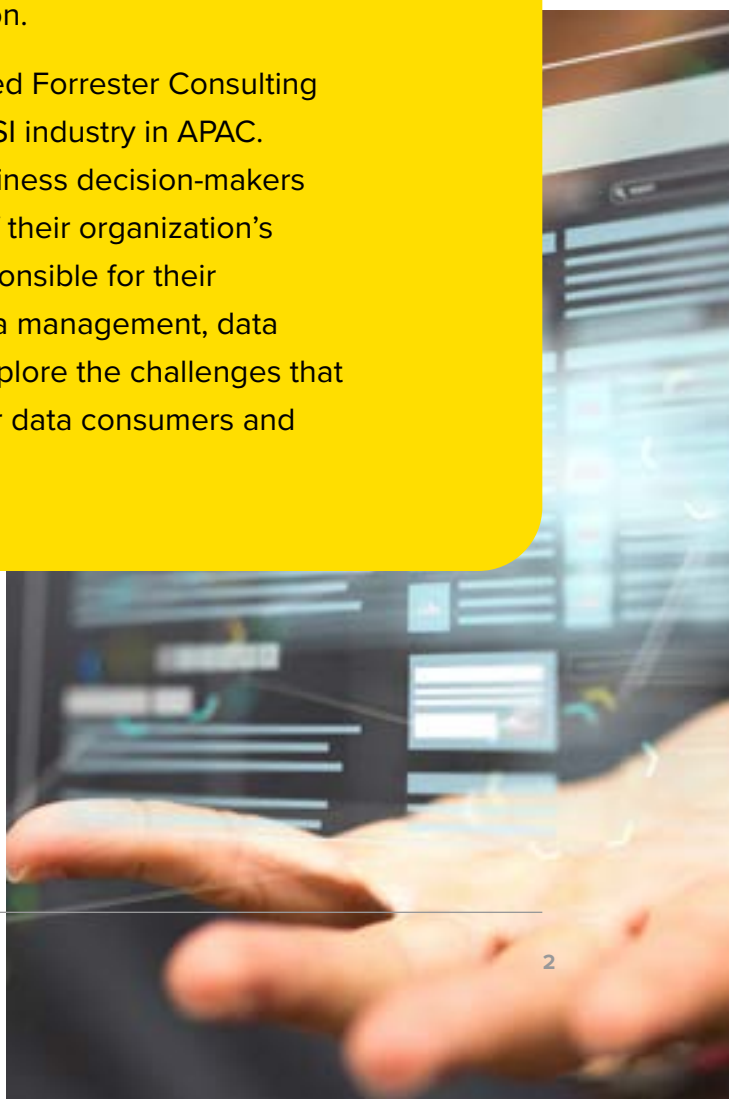
Key Findings

FSI firms' legacy approach to data architecture struggles to meet the growing demands of their data consumers. Only 43% of FSI business decision-makers in APAC characterized their organizations as being highly effective at data integration and data accessibility. This underscores the growing strain on existing data architecture in the FSI industry to meet the current and future needs of business users.

Data decentralization can help FSI firms eliminate bottlenecks, improve compliance, and foster greater innovation. Forty-four percent of banking technology professionals identified that facilitating real-time access to information from multiple sources is the top benefit they aimed to realize through decentralized data approaches.

As FSI firms increasingly embrace data decentralization, charting a holistic path to decentralization is more critical than ever. Our study uncovered that there is a movement among FSI firms to pivot toward data decentralization. Forty-five percent of FSI technology leaders reported that their organizations have implemented data decentralization in a limited capacity across a few services, while an additional 20% indicated that they have already adopted data decentralization at scale.

The creation of a single source of truth has been the focal point of many enterprises' data strategies in recent years. Organizations have invested significant resources in unifying data sources into centralized repositories, such as enterprise databases, data warehouses, and data lakes, from which business users (i.e., data consumers) can request data. However, this centralized model of data ownership has not fully delivered on its promise of driving widespread data-driven transformation:

The FSI industry has made significant strides in data-driven transformation, yet the effective use of data remains an ongoing challenge. FSI firms were early adopters in recognizing data's potential in driving innovation and gaining a competitive edge. Leading institutions have made substantial investments in analytics and data infrastructure, with data engineers and data scientists often at the top of hiring priorities. However, many decision-makers have yet to see the expected results. In fact, only 43% of FSI business decision-makers in APAC described their organizations as highly effective in data integration and accessibility (see Figure 1).

Only 43% of FSI decision-makers in APAC characterize their organizations as highly effective in data integration and accessibility.

Centralized data architectures have long been the foundation of FSI organizations' data-driven transformation. Historically, banks have relied on centralized data architectures as the cornerstone of their data strategies. This approach typically involves ingesting data from various functions — such as marketing, banking operations, and customer services — into data pipelines that handle extraction and transformation. The data is then stored in a central data lake or data warehouse, which serves as the repository for all data required by users across the organization.

A centralized data team that consolidates data expertise is another defining characteristic of this data architecture approach. Most data-focused talent (e.g., analysts, data engineers, data scientists) are typically housed within

this centralized team. Whenever a data consumer (e.g., the marketing or operations team) has a data-related request, the centralized data team typically fulfils this request.

FIGURE 1

Effectiveness of FSI Firms' Data Integration and Accessibility Initiatives

Highly effective

43%

Not highly effective

57%
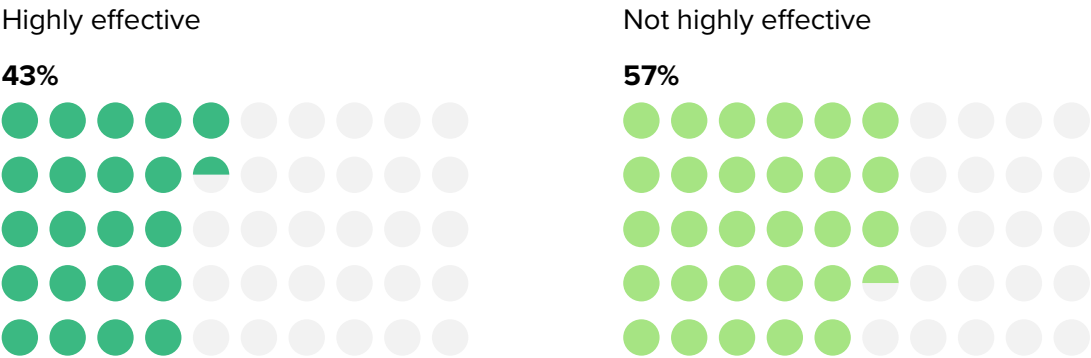
Base: 330 business decision-makers in the APAC FSI industry
Source: A commissioned study conducted by Forrester Consulting on behalf of Red Hat and Intel, September 2023

Legacy approach to data architecture struggles to accommodate greater scale and complexity. As FSI firms advance in their data-driven transformation, the proliferation of data sources has led to increasingly complex data requests. However, the centralized data architectures employed by them are under growing pressure to meet the expectations of data consumers. Several key challenges have emerged in these areas:

- **Speed and accessibility of data.** When data consumers submit a request to a centralized data team, it typically joins a queue alongside requests from other departments. After prioritizing the request against the organization's other data needs, data engineers begin developing data pipelines to ingest, transform, and provision the necessary data in the centralized repository. Depending on the existing queue and the assigned priority, this process can take anywhere from days to months to complete. These bottlenecks can significantly impact the speed and

accessibility of data, delaying decision-making and time to market for business users.

- **Single points of failure.** Centralized repositories of data can introduce critical points of failure within an organization. Data operations can be significantly impacted in the event of technical issues or cybersecurity breaches. The impact of failures is further compounded as the number of data sources increases and more applications depend on the centralized data architecture. In fact, 62% of FSI technology professionals indicated that the rapid expansion of applications and data sources has adversely affected their organization's resilience.[1]

- **Context, ownership, and quality of data.** Data consumers frequently encounter incomplete or flawed data as centralized data teams often lack the necessary domain expertise to verify how data is generated by different departments (i.e., data producers). This can be a particularly critical issue for machine learning models deployed by data consumers.

For example, a data producer may introduce a small semantic change in how a variable is defined and calculated. If this variable is used by a data consumer in another department as part of their machine learning model, it could degrade the model's performance. Centralized data teams are typically not incentivized to monitor these semantic changes, as they are more focused on operational concerns related to data transformations and loads. If data consumers identify the reason for the decrease in model performance, they must reach out to their data-producing counterparts for clarification and remediation, which incurs additional costs in time and resources.

Data decentralization is an alternative data architecture approach to centralized data ownership. Today, data decentralization's defining feature is the ability for data to reside anywhere while remaining accessible to all employees through structures known as data domains. This approach addresses the challenges associated with large, monolithic central repositories and teams. Additionally, it empowers FSI firms to more effectively embrace data democratization and its associated benefits.

Data domains are data decentralization's primary characteristic. Data decentralization refers to the distribution and dispersion of data across different locations, systems, or entities within an organization. It involves moving away from a centralized approach where all data is stored and managed in a single location or system.

In a decentralized data architecture, data producers manage and store their data in domains, each representing a distinct area of responsibility; where data consumers can then directly access this data. For example, a sales department (i.e., the data producer) may manage its own data domain focused on customer orders and transactions. Marketing analysts (i.e., the data consumers) can then access this domain directly from the sales department without the help of a centralized data team by using a data consumption layer. This consumption layer provides functionalities for data retrieval, integration, processing, presentation, security, and access control to ensure that consumers can effectively use decentralized data.

> Banking technology professionals identified facilitating real-time access to information from multiple sources as the top benefit (44%) they aimed to realize through decentralized data approaches.
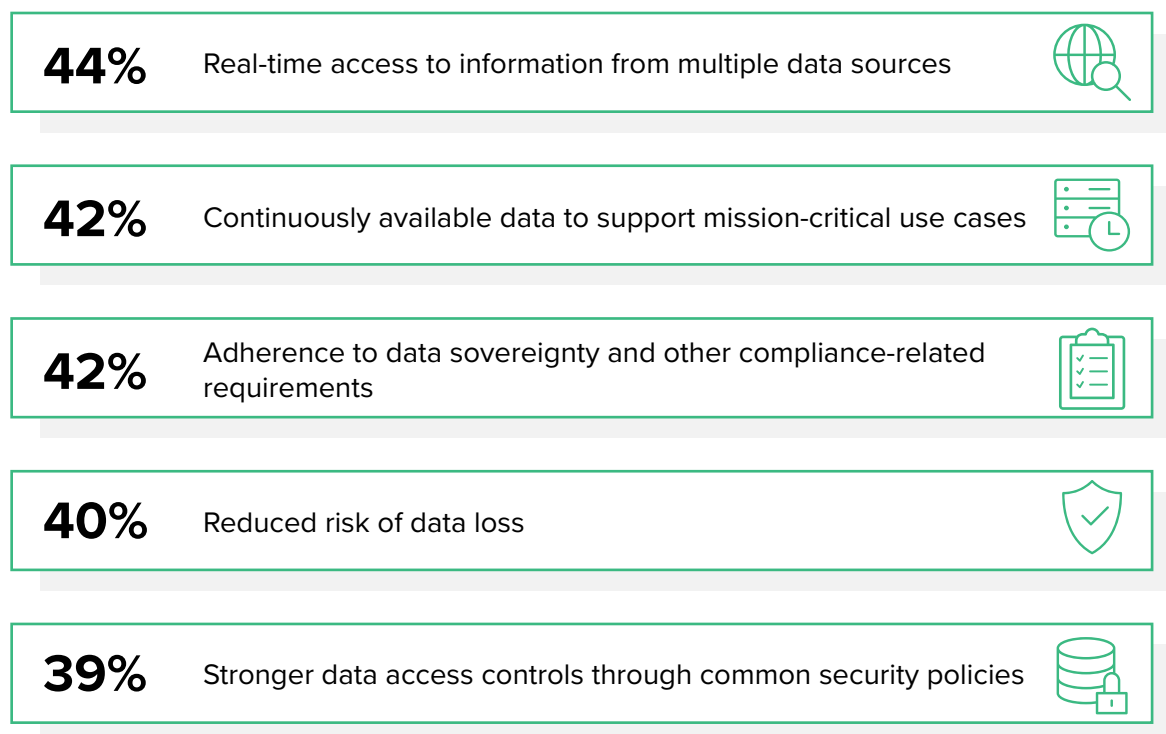
Data decentralization confers a host of benefits for FSI firms currently struggling with a centralized architecture. By devolving the responsibility for data quality, accessibility, and security to business teams that manage data domains, data decentralization can deliver significant advantages for FSI firms:

- **Distributed data access reduces bottlenecks and enhances speed to market.** Retrieving data in centralized architectures typically involves the central data repository and/or a central data team, which can lead to slowdowns and congestion. In a decentralized setup, access is distributed across multiple localized systems that allow for direct self-service access and reduces dependence on singular points of access. This can reduce latency and response times, which are especially important for services that require real-time data access. More advanced data domain owners can also develop fully fledged data products that are easier for data consumers to use. In fact, 44% of technology professionals in banking identified facilitating real-time access to information from multiple sources as the top benefit they aimed to realize at their organization through decentralized data approaches (see Figure 2).

- **Combining data ownership with domain expertise enhances data quality.** As data producers have clear ownership of their domains, they are responsible and accountable for the quality of the data in those domains and are better incentivized to ensure data accuracy, reliability, and completeness. Additionally, as data owners, they can leverage their context-specific understanding of underlying data to identify and remediate data quality issues more effectively than a central data team could. This enables further improvements in data quality.

- **Stronger data access and handling controls can improve data compliance.** Decentralization allows for more granular control over data access permissions. Each system within the decentralized model can have its own access control mechanisms that define who can access specific data within their domain. Data domain owners are better able to interpret the principle of providing access on a need-to-know basis due

to their domain expertise. This enables fine-grained control over data access based on roles, responsibilities, and data sensitivity.

FIGURE 2

Top Five Anticipated Benefits Of Decentralized Data Approaches For Banks

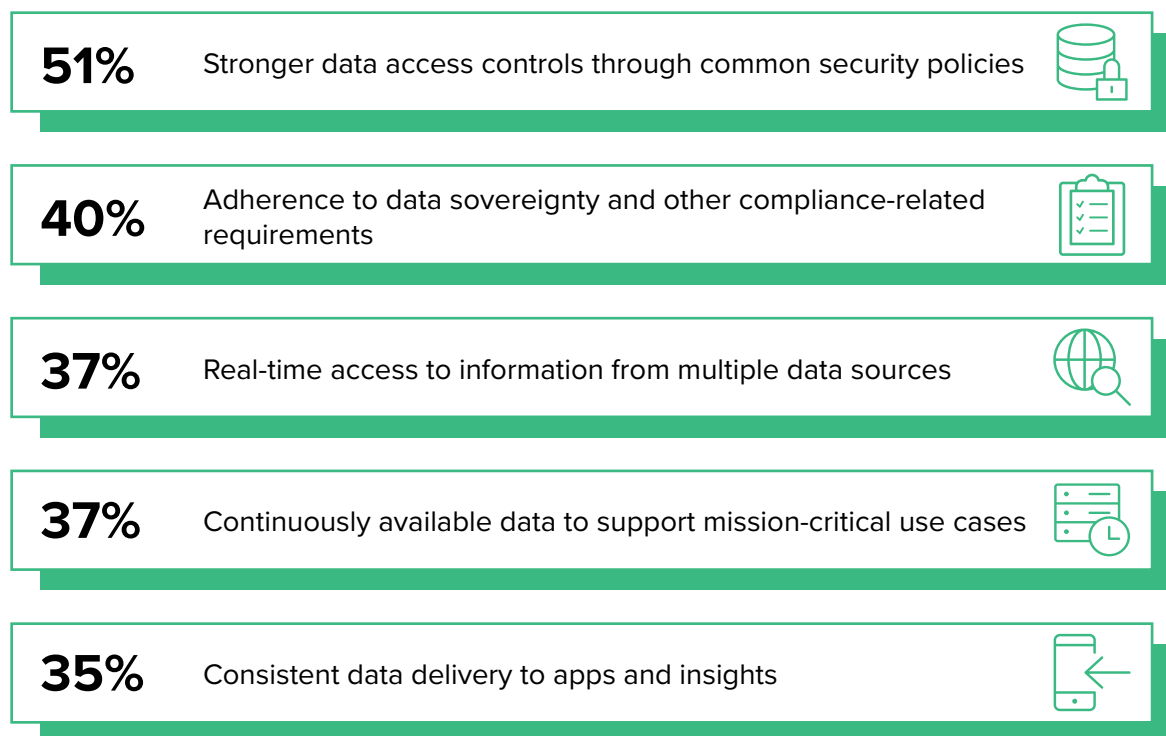| **44%** | Real-time access to information from multiple data sources |
42%	Continuously available data to support mission-critical use cases
42%	Adherence to data sovereignty and other compliance-related requirements
40%	Reduced risk of data loss
39%	Stronger data access controls through common security policies

Base: 108 tech professionals in the APAC banking industry
Source: A commissioned study conducted by Forrester Consulting on behalf of Red Hat and Intel, September 2023

Additionally, the consumption layer in decentralized architecture can help data users locate and manage specific data related to an individual more easily. This enables organizations to fulfill data subject requests efficiently and effectively, ensuring compliance with relevant privacy regulations. Fifty-one percent of technology professionals in insurance cited this as the top benefit that they expect to realize through decentralized data (see Figure 3).

FIGURE 3

Top Five Anticipated Benefits Of Decentralized Data Approaches For Insurers

51%   Stronger data access controls through common security policies

40%   Adherence to data sovereignty and other compliance-related requirements

37%   Real-time access to information from multiple data sources

37%   Continuously available data to support mission-critical use cases

35%   Consistent data delivery to apps and insights

Base: 106 tech professionals in the APAC insurance industry
Source: A commissioned study conducted by Forrester Consulting on behalf of Red Hat and Intel, September 2023

Data democratization through decentralized approaches can help forge a data-driven culture. More than one in two technology professionals in banking and insurance indicate that fostering a culture of data-driven decision-making has been a challenge for their organizations (see Figure 4). Data decentralization can support data democratization efforts by making data more accessible to more users within an organization. When data is decentralized and ownership is distributed, it becomes easier for different teams and individuals to access and utilize the data they need for their specific tasks or projects. This promotes a culture of data-driven decision-making and empowers users across the organization.

FIGURE 4

FSI Firms That Indicated The Fostering Of A Data-Driven Decision-Making Culture As A Key Challenge

Banks   Insurers

54% ▬▬▬▬▬▬▬▬▬ ○ ▬▬▬▬▬▬▬▬▬ **53%**

Base: 166 and 164 business decision-makers in the APAC banking and insurance industries respectively
Note: Showing sum of responses for "Challenging" and "Extremely challenging".
Source: A commissioned study conducted by Forrester Consulting on behalf of Red Hat and Intel, September 2023

Decentralized data models also encourage collaboration and innovation within an organization. Direct access to data domains enables efficient collaboration and data exchange between different entities (e.g., departments, functions, or teams). These entities can also work independently on their own data domains and contribute their unique expertise and perspectives to create innovative new data products in an agile manner.

Within a decentralized architecture, data products allow every employee to export their data to other users as a plug-and-play service. Data products consist of various components, including data sets, policies, pipelines, models, and delivery methods such as APIs. Business teams (i.e., product owners and managers) create and continuously manage, govern, and optimize these data products for their users to achieve measurable business outcomes. In doing so, business teams apply product thinking to the data assets they own to compose innovative services that offer measurable benefits for data users. For example, a customer research team in a bank can create a data product that helps sales teams recommend add-on financial products that are tailored to an individual customer's unique requirements referenced from data assets on customer demographics and behavior.

In these ways, data decentralization fosters a culture of localized data innovation and enables the cross-pollination of new insights and ideas than a central data team ever could.
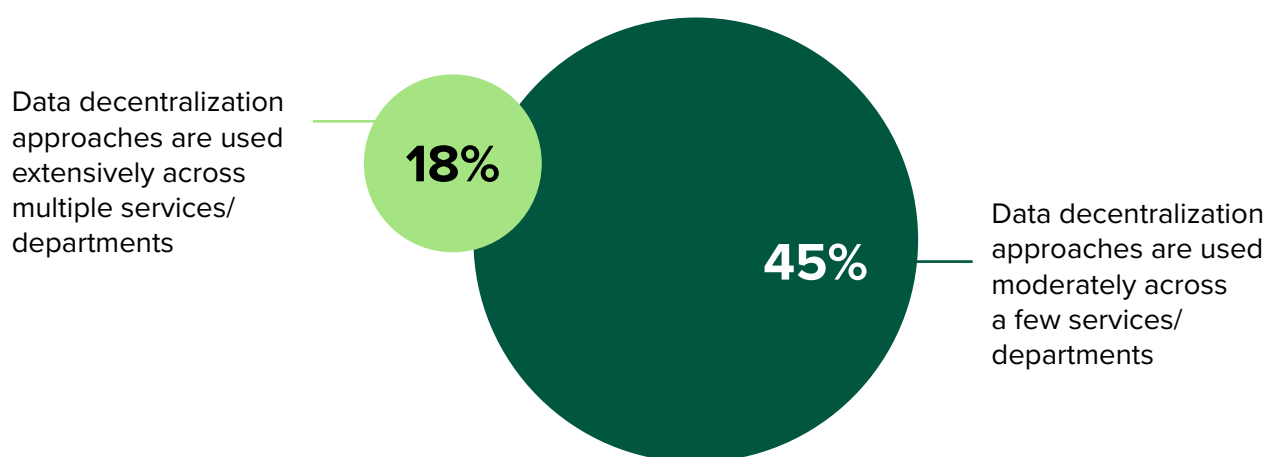
The pendulum has swung from a centralized to a decentralized data approach as FSI firms evolve their data operations to live closer to the point of business value. However, it is crucial to recognize that data decentralization requires foundational investments to ensure its success. Organizations must establish the necessary mechanisms and processes to ensure proper coordination, standardization, and synchronization of decentralized data.

Most FSI firms have already deployed data decentralization approaches, with leading FSI firms already deploying at scale. Data decentralization is not merely a theoretical approach to data architecture; most FSI firms have already begun their shift to decentralized models. Forty-five percent of FSI technology leaders reported that their organizations have implemented data decentralization in a limited capacity across a few services, while another 18% indicated that they have already adopted data decentralization at scale (see Figure 5).

FIGURE 5

Data Decentralization Adoption Rates Among FSI Firms

Data decentralization approaches are used extensively across multiple services/departments

18%

45%

Data decentralization approaches are used moderately across a few services/departments

Base: 214 tech professionals in the APAC FSI industry
Source: A commissioned study conducted by Forrester Consulting on behalf of Red Hat and Intel, September 2023

This indicates that FSI firms across the APAC region are embracing data decentralization to empower self-service data access — this enables data-driven decision-making and enhances business agility and innovation. FSI firms that have yet to consider data decentralization as a key component of their overall data architecture risk being left behind by their competitors.

Develop a holistic roadmap for data decentralization that goes beyond technical considerations. Achieving the full benefits of decentralizing data necessitates a well-designed approach to data architecture. When constructing this approach, technology leaders must ensure that technical discussions do not overshadow the business' needs and practices. The following is a list of best practices for building a holistic roadmap for data decentralization:

- **Establish the goals of decentralization and assess the existing data landscape.** The first step to decentralization is to clearly articulate the objectives and goals of the data decentralization initiative. Technology leaders must identify the specific benefits they aim to achieve, such as improved data accessibility, enhanced security, or better decision-making. They must also ensure the objectives align with the overall business strategy.

- **Technology leaders will then need to address the pain points or challenges in the existing data environment.** This can be done by evaluating the current data landscape including data sources, systems, governance practices, and integration capabilities; and identifying any issues, limitations, or inefficiencies that need to be addressed through decentralization.

Establish use cases and prioritize proposed data domains. Technology leaders must identify specific use cases or scenarios that can benefit from data decentralization. Consider areas where distributed data can enhance decision-making, enable collaboration, or improve operational efficiency. Determine the data domains or entities that would be involved in each use case and define their roles and responsibilities in managing decentralized data.

Subsequently, FSI technology leaders should prioritize the data domains or

datasets that should be decentralized based on their strategic importance, data sensitivity, or potential impact on achieving the defined objectives. Consider factors such as data availability, data quality, and data integration requirements for each dataset. Start with smaller, more manageable projects to gain early wins and build momentum.

Define your decentralization approach and select foundational technologies. FSI technology leaders must identify and choose the specific approach or technology that will be employed to achieve data decentralization within their organization. This involves assessing the suitability of frameworks such as data mesh or data fabrics — or both — as well as the suitability of specific technologies and tools (e.g., distributed databases, data virtualization platforms, data replication tools, or other decentralized technologies). The selection process involves considering factors like scalability, security, integration capabilities, ease of implementation, and alignment with the organization's goals and use cases. Selecting the appropriate decentralized architecture enables organizations to establish the foundation for an effective decentralized data management system that meets their specific needs and objectives. For instance, one in two technology leaders indicated that their organizations are already using data virtualization tools and 49% noted the same for query accelerator tools, with a further 39% using data replication tools (see Figure 6).[2,3,4]

Establish appropriate data governance practices. Based on the chosen approach for decentralization, FSI technology leaders must define a decentralized data governance framework that outlines the policies, procedures, and controls for managing and securing decentralized data. This is a critical step, as 53% of FSI business decision-makers indicated that establishing a data governance model has been a challenge for their organizations. Leaders must set clear guidelines for data ownership, access control, data sharing, data quality, and privacy. Ensure that the governance framework aligns with regulatory requirements and industry best practices.

Start with a pilot project. FSI technology leaders should be ready to begin pilot projects to test and validate the decentralized data architecture. They should earn from these initial implementations and iterate on the approach

based on feedback and lessons learned. Gradually expand the scope and scale of the decentralized data architecture, while incorporating feedback and making necessary adjustments.

Educate and train stakeholders to foster a culture of data ownership, security, and collaboration. As FSI firms navigate this shift toward decentralized data, it is vital for them to consider the human element as well: They must provide training and support to users and stakeholders to ensure their understanding of the benefits and processes associated with decentralized data management. Then, implement change management strategies to address any resistance or concerns related to the transition toward a decentralized model. They should also communicate the value of data decentralization and address any cultural or organizational barriers to adoption.

FIGURE 6

Levels Of Deployment For Tools That Manage Decentralized Data
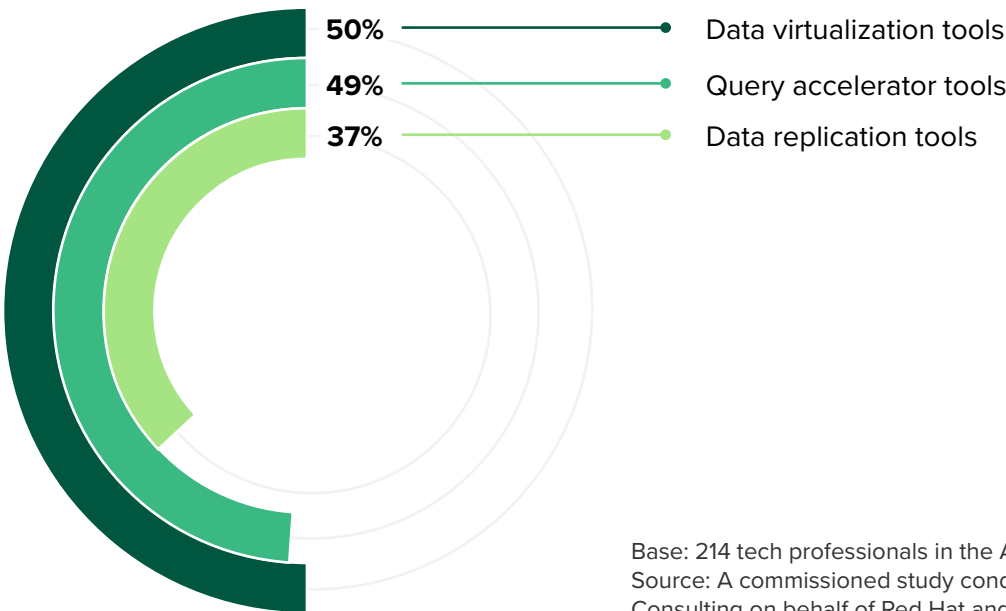
50% — Data virtualization tools
49% — Query accelerator tools
37% — Data replication tools

Base: 214 tech professionals in the APAC FSI industry
Source: A commissioned study conducted by Forrester Consulting on behalf of Red Hat and Intel, September 2023

The shift toward data decentralization is gaining momentum in the FSI industry, with most organizations moving away from a fully centralized model. Successfully navigating this transition requires organizations to move beyond a single source of truth and adopt multiple sources of truth (MSOT), each considered equally valid within its specific context. The primary challenge for technology leaders — beyond technical considerations — is ensuring that both their organization and its employees can effectively adapt to this evolving paradigm.

Key Recommendations

In recent years, FSI firms have faced challenges in meeting business users' demands for data integration and access due to limitations in traditional data architectures. However, data decentralization has emerged as a viable alternative to the centralized model, addressing many of the issues associated with legacy data architecture approaches. As more FSI firms transition to decentralized data approaches, it is essential for adopters to implement a holistic strategy that goes beyond just technologies and tools. Our study yielded several important recommendations:

Identify and define specific goals and use cases to drive successful data decentralization efforts.

While most survey respondents indicated that their organizations had already embraced data decentralization in at least a limited manner, FSI firms should not rush headfirst into a data decentralization initiative before articulating the goals and use cases for decentralization. Clearly defining the goals and objectives will allow organizations to align their efforts toward specific outcomes such as improved data accessibility, enhanced collaboration, or increased efficiency. Use cases identify specific scenarios or areas where decentralization can bring the most value and address pain points. Ultimately, goal identification and use case analysis help organizations prioritize their efforts, allocate resources effectively, and drive the successful implementation of a decentralized data architecture.

Consider how existing centralization data architecture can be complimentary to decentralized approaches.

Just as a fully centralized data paradigm is now considered unrealistic, a fully decentralized data architecture is also impractical for most enterprises.[5] Existing centralized elements, such as data warehouses and data lakes, can be integrated into a more decentralized architecture. While most of an

organization's analytical activities can be decentralized, certain organization-wide analytics services may still be best delivered through centralized models — this offers advantages in reducing redundancies and improving data consistency. Additionally, the role of the central data team can be reimagined to provide guidance and establish standards for data domain owners.

Plan for integration and interoperability.

Open architecture standards are essential for facilitating decentralized data by ensuring interoperability and compatibility across various systems and technologies. These standards provide common protocols, formats, and interfaces that enable seamless integration and data exchange between decentralized data sources. Adhering to open architecture standards will enable organizations to avoid vendor lock-in, encourage innovation, and develop scalable, adaptable decentralized data environments that harness the collective intelligence of the broader community.

Involve the right partners to support your organization's transition to decentralized data.

Leverage partners with specialized expertise in data management, data governance, technology infrastructure, and industry-specific insights. Consider partnering with these experts to provide guidance, best practices, and proven methodologies for implementing decentralized data architectures. Additionally, utilize training, consulting services, and ongoing technical support from these partners to ensure the successful implementation and operation of decentralized data environments.

Appendix A: Methodology

In this study, Forrester conducted an online survey of 330 business decision-makers and 214 tech professionals from FSI organizations in Australia, Hong Kong, India, Japan, Taiwan, and Southeast Asia (Singapore, Malaysia, Indonesia, and Thailand) to evaluate the role of data in building operational resilience. The study began in August 2023 and was completed in September 2023.

To read the full results of this study, please refer to the Thought Leadership Paper commissioned by Red Hat and Intel titled, "The Path To Operational Resilience Begins With Reliability and Risk Management".

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Appendix B: Demographics

BUSINESS DECISION-MAKERS

REGION	
Australia	**16%**
Hong Kong	**17%**
India	**17%**
Japan	**16%**
Taiwan	**7%**
Southeast Asia	**26%**

LEVEL OF RESPONSIBILITY	
Final decision-maker	**48%**
Part of a team making decisions	**31%**
Influence decisions	**21%**

NUMBER OF EMPLOYEES	
1,000 to 2,499	**14%**
2,499 to 4,999	**30%**
5,000 to 19,999	**33%**
20,000 or more	**22%**

INDUSTRY SEGMENT	
Banking	**50%**
Insurance	**50%**

DEPARTMENT	
Finance/accounting	**16%**
CX	**15%**
Banking operations	**13%**
Insurance operations	**12%**
Strategy	**10%**
Business analytics	**9%**
Digital business	**9%**
Governance, risk, and compliance	**8%**
Sales	**5%**
Legal	**3%**

Appendix B: Demographics

BUSINESS DECISION-MAKERS (CONTINUED)

ANNUAL REVENUE	
$500 million to $999 million	**29%**
$1 billion to $5 billion	**45%**
More than $5 billion	**26%**

POSITION	
C-level executive	**18%**
Senior vice president/president	**48%**
Senior manager/director	**35%**

Note: Percentages may not total 100 due to rounding and/or exclusions due to screening criteria.

TECHNOLOGY PROFESSIONALS

REGION	
Australia	**16%**
Hong Kong	**17%**
India	**16%**
Japan	**16%**
Taiwan	**8%**
Southeast Asia	**27%**

NUMBER OF EMPLOYEES	
1,000 to 2,499	**14%**
2,499 to 4,999	**34%**
5,000 to 19,999	**31%**
20,000 or more	**21%**

ANNUAL REVENUE	
$500 million to $999 million	**29%**
$1 billion to $5 billion	**41%**
More than $5 billion	**31%**

POSITION	
C-level executive	**18%**
Senior vice president/president	**50%**
Senior manager/director	**32%**

INDUSTRY SEGMENT	
Banking	**50%**
Insurance	**50%**

DEPARTMENT	
IT operations	**24%**
IT infrastructure	**23%**
Application design and development	**13%**
Platform engineering	**13%**
Systems analysis	**9%**
Data engineering	**9%**
Enterprise architecture	**8%**

TECHNOLOGY PROFESSIONALS (CONTINUED)

LEVEL OF RESPONSIBILITY (DATA INFRASTRUCTURE)	
Final decision-maker	**64%**
Part of a team making decisions	**20%**
Influence decisions	**8%**

LEVEL OF RESPONSIBILITY (DATA ANALYTICS)	
Final decision-maker	**40%**
Part of a team making decisions	**37%**
Influence decisions	**14%**

LEVEL OF RESPONSIBILITY (DATA MANAGEMENT)	
Final decision-maker	**32%**
Part of a team making decisions	**44%**
Influence decisions	**17%**

LEVEL OF RESPONSIBILITY (IT SECURITY AND RISK)	
Final decision-maker	**47%**
Part of a team making decisions	**24%**
Influence decisions	**12%**

Note: Percentages may not total 100 due to rounding and/or exclusions due to screening criteria.

Appendix C: Supplemental Material

RELATED FORRESTER RESEARCH

"The Modern Data Environment Uses Both Data Fabric And Data Mesh," Forrester Research, Inc., April 26, 2023.

Appendix D: Endnotes

[1] Source: "The Path To Operational Resilience Begins With Reliability And Risk Management," a commissioned study conducted by Forrester Consulting on behalf of Red Hat and Intel, March 2024.

[2] Query virtualization tools enable seamless access and integration of data from multiple distributed sources without requiring data movement, thereby enhancing the efficiency and flexibility of decentralized data environments.

[3] Query accelerator tools are software components that optimize query performance by improving query response times and efficiency, which enables faster data retrieval and analysis in decentralized data environments.

[4] Data replication tools are software solutions that create and synchronize copies of data across multiple systems by ensuring data consistency and availability across distributed environments, which supports data decentralization.

[5] Source: The Modern Data Environment Uses Both Data Fabric And Data Mesh, Forrester Research, Inc., April 26, 2023.