The Traditional Data Catalog is Dead, Long Live the Enterprise Data Marketplace

Explore the rise of the EDM and what it means for the future of scalable, governed, decentralized data management.

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Executive Summary

The data catalog was supposed to be the Nirvana of democratizing data access, allowing everyone within an organization to discover, understand, trust, and use data. To their credit, data catalogs have many use cases that can be summarized into three key areas:

- Accessible data for analytics and artificial intelligence (AI)
- Support for data engineering teams
- Data compliance with general and sector-specific regulations

However, as data leaders such as chief data officers, heads of data, heads of analytics, and heads of data governance have experienced, not all data discovery projects are successful. That's because implementing an enterprise data catalog is not easy. As a result, many of these projects are not delivering on their promises, causing companies to abandon them.

Organizations across industries are embarking on large-scale data management projects, each with their own culture, objectives, and data architecture. Some are newcomers to data catalog technologies, while others are in their second phase and seeking to replace existing solutions.

Despite their differences, all of these organizations have something in common—their data catalog projects are long, costly, complex, and a large proportion either do not deliver value or deliver very little value to end users. This makes achieving a return on investment extremely difficult.

This eBook explores in detail the challenges faced by traditional data catalogs and introduces the concept of an enterprise data marketplace (EDM). It shows how an EDM, especially in decentralized data management approaches, transforms how organizations manage and use their data by offering advanced search, discovery, and governance capabilities. The eBook also presents best practices for successfully implementing an EDM by sharing 10 tips based on the experiences of pioneers in this field.

Why Traditional Data Catalogs Are Doomed to Disappear

Many data catalog deployments result in waste, do not achieve their full potential, or experience failure. The root cause of these issues is their very low adoption rate across organizations. Here are nine reasons for that low adoption:

1. A Confusing User Experience

The primary reason for the low adoption of data catalogs by business users is a user experience (UX) that fails to fulfill its promise. UX refers to a user's overall experience when interacting with a digital device. It combines ergonomics, the efficiency of the path to achieve stated goals, and the ability to find what the user is looking for quickly—such as data assets for business use cases.

Many data catalogs resemble the cockpits of Boeing 777s, with a multitude of buttons, tabs, and menus that are confusing. This goes against good UX practices, such as the three-click rule, to reach the desired search result.

During the evaluation phase of a data catalog, a best practice is to place users in real-world situations with varied test scenarios that reflect actual or potential use cases. This offers a more realistic user experience than solely relying on passive demos.

The Three-Click Rule

The three-click rule states that users should be able to find any information on a website or application in three clicks or less. It emphasizes simplicity and clear navigation to enhance user satisfaction.

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2. A Faulty Search Engine

The second reason for the low adoption of data catalogs is simple—end users struggle to find what they're looking for due to the search engine's lack of relevance. This common issue is often systematically overlooked by data catalog providers.

The search engines used in traditional data catalogs usually index only certain information, such as table names, column names, descriptions, and values of specific metadata organized hierarchically. However, this outdated approach has quickly been surpassed by more advanced methods. A parallel can be drawn to the transition from the popularity of the Yahoo search engine in the 2000s to today's dominance by Google, which introduced a revolutionary approach to search with its knowledge graph.

Scaling a data catalog, which is expected to reference and document thousands, tens of thousands, or even millions of objects, requires a powerful search engine. Without it, the search functionality may not be selective enough, leading users to become overwhelmed by a multitude of data assets, many of which may not be relevant, and they quickly abandon the platform.

First impressions are crucial, and users are unlikely to return to the data catalog if their initial experience is subpar. That's why benchmarking the search aspect at scale is essential.

3. Poor Quality and Organization of Metadata

Users need relevant, complete, and quality metadata. The data classifications proposed to users must resonate with them. The teams responsible for these aspects often attempt to create a universal data classification.

However, the concepts they handle are not universal. Concepts can change depending on domains, such as sales, HR, finance, or logistics, along with users' needs, including analytics, data science, and regulatory compliance, as well as a user's role in the organization.

For example, finance professionals will seek familiar entry points in their data catalog, such as EBITDA or gross margin, which are key financial performance indicators. Conversely, a head of manufacturing will feel more comfortable with concepts such as a factory, machines, spare parts, or lots. This diversity in search preferences highlights the inadequacy of a universal classification system.

Research domains must be organized by specific ontologies rather than a universal and hierarchical classification. A knowledge graph helps by bringing a major technological breakthrough—it captures knowledge.

Comprising networks of nodes, or concepts, and links that convey the semantics of data relationships, a knowledge graph aligns perfectly with the need for ontologies (Figure 1). Moreover, this technology offers remarkable flexibility in designing and evolving the data catalog, especially when incorporating new business data or addressing emerging user needs.
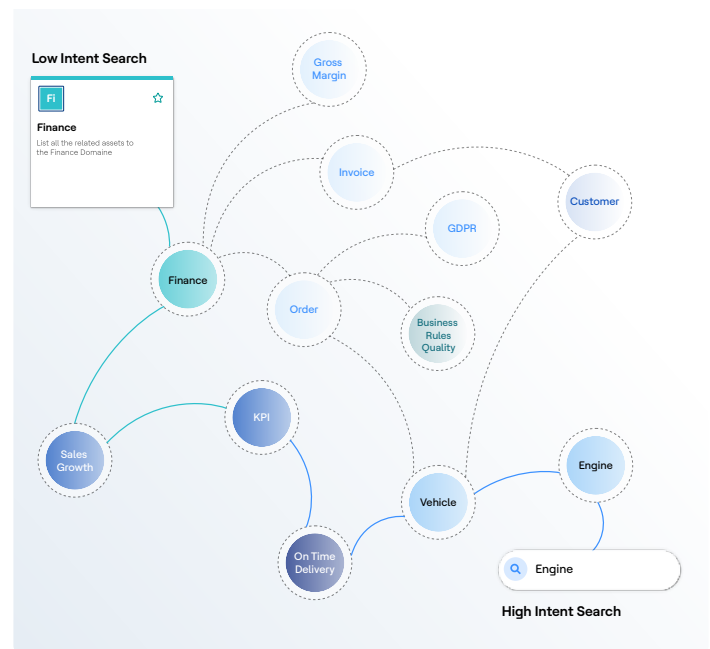

Figure 1: Data Classification Knowledge Graph

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4. Inadequate Information Provided to Users

There's a tendency for data teams to define an overly large and unmaintainable set of metadata during catalog deployment, which is another reason for low adoption. Unless metadata is supported by a dedicated army of data stewards, this approach alienates users.

The ideal approach is for all metadata to be maintained without intervention, with 100% automation of its collection and maintenance, regardless of origin. However, poor metadata quality or its incomplete nature often tends to discourage users.

The solution is to systematically automate metadata maintenance. Only some data catalogs currently offer automation. This limitation is particularly burdensome considering that data assets often reside on both legacy and on-premises systems, making access more constrained.

5. Lack of Data Discovery Capabilities

Users often do not have an exact idea of the data assets they're looking for. The adoption of a data catalog is driven by the need to efficiently uncover meaningful insights from data, particularly when addressing complex user inquiries. It becomes essential to differentiate between search and discovery.

For instance, a search query might ask, "What sales dashboards are available to me?" A traditional data catalog can typically answer this accurately, depending on the capabilities of the search engine.

On the other hand, a discovery scenario might involve a query such as, "I want to create a dashboard for my operating margin, but I'm unsure where to start. I'll begin with some data I've found and explore my catalog to uncover additional relevant datasets." This illustrates the distinction between searching for specific information and exploring data to uncover new insights.

Traditional data catalog search methods often fall short of expectations because they're overly simplistic. Only semantic and lexical analysis, similar to the techniques employed by the Actian Data Intelligence Platform and modeled after the Google search engine, can uncover valuable data assets when users have only a vague idea of what they're seeking.

Data discovery often resembles navigating the web. Users can explore and follow links, traversing various paths they may not have anticipated.

6. Data Access Takes Too Long and Is Too Complex

Delays in accessing data also contribute to low user adoption. While finding data assets using a data catalog is promising, the experience can be frustrating if users don't have a simple way to access the data quickly.

The missing link in the UX provided by traditional data catalogs is called "data shopping." This concept does not inherently involve internal transactions, but instead focuses on identifying compliance rules and ensuring their adherence.

Data shopping involves gaining authorization from data asset owners to access and use data catalog-discovered data. This enables rapid, efficient access while adhering to established governance rules. However, traditional data catalogs often create frustration because accessing the data takes too long once it's identified. It's the equivalent of spending a few minutes shopping and buying an item online, then waiting weeks for it to be delivered.

This waiting phenomenon is known as the "End of the Journey." Traditional data catalogs have yet to devise a simple and quick method for delivering explored data once it has passed the strict data governance requirements. Due to the volume of requests, automating this process of "data policy enforcement" has become necessary.

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7. Insufficient Documentation of Data

The insufficient documentation of data within a data catalog is also a barrier to adoption. The process of extracting, transforming, and loading (ETL) data into a data platform, combined with the burden of producing corresponding documentation in the data catalog, creates a significant bottleneck and often leads to a gradual depletion of the content over time.

This bottleneck in data availability is mirrored by a similar phenomenon with metadata. While there is no shortage of metadata types, they often need to be complete. And without automation mechanisms, ensuring comprehensive metadata coverage becomes daunting.

8. Poor Project Management of Data Catalogs

The extended timeframe required for data catalog projects to deliver value to businesses further restricts adoption. This is especially true given the increasing expectations for analytics and the justified enthusiasm for using AI.

This is fundamentally a project management issue— projects can stretch over months or even years, then deliver insignificant results. Data catalog projects frequently lack organization, which makes it difficult to address high-value use cases and meet the needs of multi-disciplinary teams.

9. Lack of Awareness of the Data's Value Potential

The final reason for the low adoption of data catalogs is the need for more awareness of data's value potential and its pivotal role in the journey toward digital transformation. Organizations cannot precisely quantify the value of their data assets and consequently, not effectively communicate the importance of the asset. Any initiative is destined to fade without demonstrating value.

Quantifying Data Value

Data consumers need to understand the why, how, and what of their data assets:

- Why is data important for the company and end users?

- How can users contribute to the organization's data strategy?

- What can users do with data for their daily jobs?

Gaining this understanding helps address the issue of value quantification by providing users with ways to evaluate data and encourage collaborative work.

Common Cause of Delays

Each cross-functional team in an organization brings its own requirements to a data catalog project. As a result, projects are frequently executed horizontally rather than vertically. This suboptimal approach to project management results in intolerable delays, particularly given users' increasingly urgent needs.

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The Enterprise Data Marketplace: The Necessary Evolution of Data Catalogs

Traditional data catalogs require rethinking or replacement with a more effective solution—while preserving catalogs' demonstrated capabilities. The solution that addresses this issue is the enterprise data marketplace (EDM).

EDM: Taking Inspiration from e-Commerce

An EDM is an e-commerce-like solution where data producers can publish their data products, and data consumers can discover, understand, and consume the published data products.

The EDM allows organizations to successfully democratize data access to exploit the full potential of their data assets. An EDM serves as an internal data marketplace within an organization that relies on one or more data catalogs to share and exchange the most valuable data from different domains. The information is presented as data products. The more advanced the data catalogs, the more the EDM fulfills its mission of delivering value.

To clarify, an EDM is not a traditional data marketplace where companies sell data to buyers in exchange for payment and usage rights. Likewise, it's not a public marketplace focusing on a domain in which clients can buy or rent specialized data.

Instead, an EDM allows users to search, discover, and utilize data assets from across the organization. Terms of data access are defined by the company's data governance and, as much as possible, supported by automation mechanisms.

The concept of a data product is central to an EDM. A data product is defined as a set of high-value data assets specifically designed and managed to be consumed quickly and securely—while ensuring the highest quality, availability, and compliance with regulations and internal policies.

The Role of the EDM in Decentralizing (Meta) Data Management

An EDM represents a significant evolution in data management. It accompanies the decentralization trend in data management, particularly at the metadata management level, with the growing success of data mesh principles.

Centralized and monolithic data management anchored in a data lake or data warehouse creates a massive bottleneck that inhibits innovation and limits the capacity of data teams to respond to increasingly pressing business demands (Figure 2). This has led to the progressive adoption of decentralized data management, notably through the data mesh.

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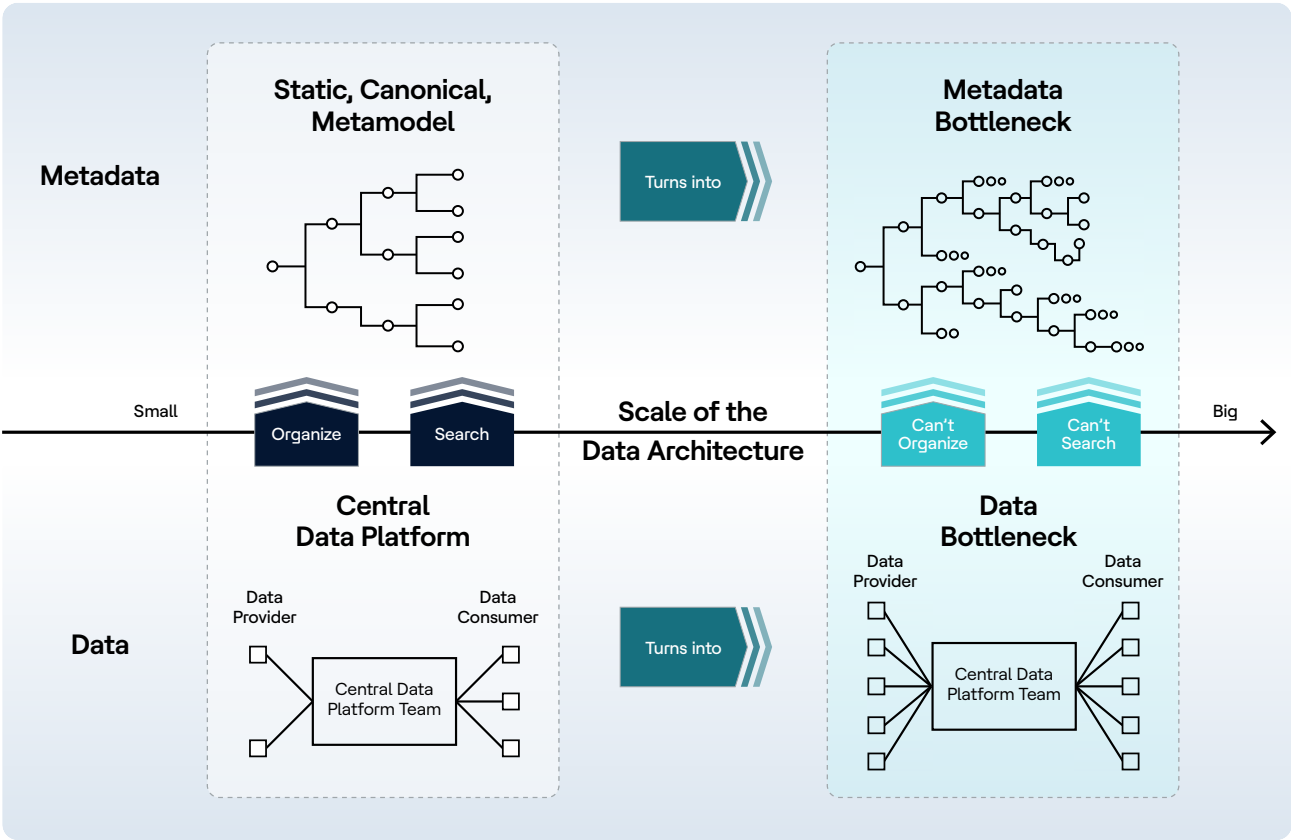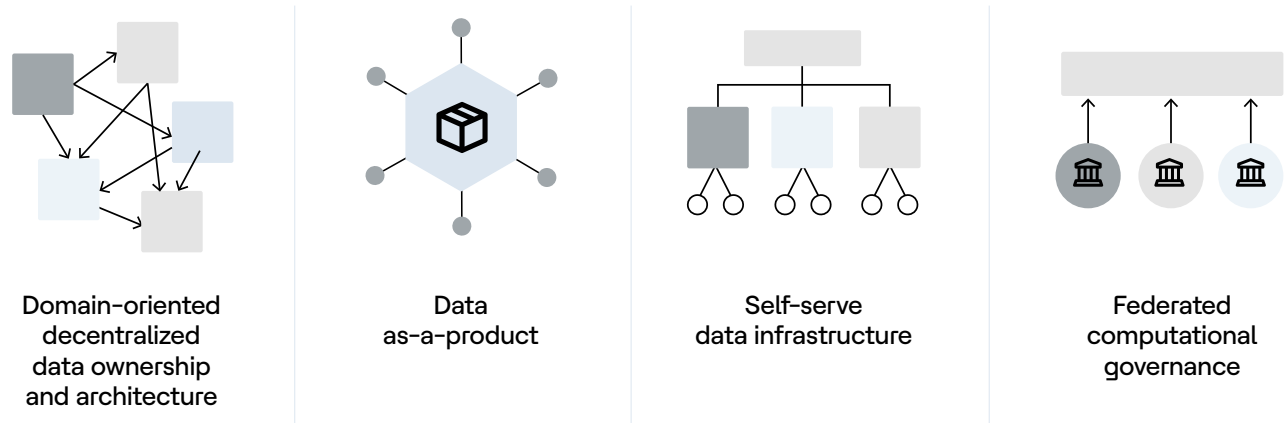a division of **HCLSoftware**

Figure 2: Bottleneck Caused by Centralized Data Management

This paradigm shift is based on four fundamental principles that impact both data management and metadata management:

Domain-oriented decentralized data ownership and architecture

Data as-a-product

Self-serve data infrastructure

Federated computational governance

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The decentralization of metadata management requires rethinking how metadata is managed. That's because it's impossible to decentralize data management while keeping centralized metadata management.

The data mesh is far from being a fad. Instead, it represents a profound change that's being embraced by numerous companies, as evidenced by recent surveys from BARC and Eckerson.

Data mesh is taking over the world with massive adoption by large-scale organizations

85% of organizations recognize the relevance of the data mesh
–BARC Survey, 2023

54% of companies are planning to implement or are implementing the data mesh
–BARC Survey, 2023

70% of organizations have or are in the process of implementing data products
–BARC Survey, 2024

Although the data mesh is well documented, it's often described in an idealized final state without detailing the practical steps to achieve it. This gap raises a crucial question—how can organizations effectively transform their data management and metadata management practices to implement a data mesh? The EDM provides an answer.

Key Capabilities and Characteristics of an EDM

The EDM allows the various domains of an organization to share their high-value data—datasets, dashboards, analytical reports, and AI models—in the form of packaged data products. Here are the essential characteristics and capabilities for a

proper functioning EDM, which also help mitigate the causes of data catalog project failures:

Powerful Search Capabilities for Business Users

Like when using a data catalog, the organization's data consumers, or end users, expect their EDM to be able to discover data products easily and effectively. The EDM must, therefore, use a powerful search engine to avoid reproducing the failures of traditional data catalogs in terms of data discovery.

Merely indexing table names, column names, descriptions, and tags is insufficient. This is evident when vendors rely on open-source data catalogs that lack in the search and discovery domain.

An EDM that references many data products must have powerful capabilities. In this sense, knowledge graph technology offers a breakthrough in the user experience and perfectly aligns with the data decentralization movement.

A knowledge graph serves as a semantic indexing structure for the search engine and provides a powerful way to offer personalized search and discovery experiences. For example, the Actian Data Intelligence Platform's knowledge graph offers a unique feature—ranking. The search engine explores the graph through lexical and semantic analysis, producing much more relevant search results.

To understand this fundamental technological difference, it's important to note that two objects matching a search query won't necessarily appear in the same position within the results list. The ranking will favor the item with the highest connectivity to semantically identical or closely related items to the search query.

Also, because a data product is a packaged set of assets, it's preferable to have a 360-degree view of the objects the data product encompasses. Once again, the knowledge graph proves to be a highly effective technology for delivering an exhaustive perspective on the objects comprising a data product.

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Flexibility in Data Product Design

Data products offer a new and promising way to represent data. They're a packaged set of data assets accompanied by numerous metadata that provide information for data consumers, such as version, producing domain, quality, service level agreement (SLA), and more.

Because each company defines its unique implementation of data products and the associated metadata set, the utmost flexibility is necessary. For example, the Actian Data Intelligence Platform, in its design, refrains from imposing a rigid definition of what constitutes a data product.

Instead, it enables each organization to define a data product with flexibility and scalability, within the platform. This approach sets the data intelligence platform apart from many other platforms in the field.

Complete Information Exposure on Data Products

Organizations need a clear, well-understood vision of their data products—one that's easily accessible to analysts, data consumers, and other end users. The depth and quality of this information ultimately depend on how the organization defines its data products and how well they're maintained over time.
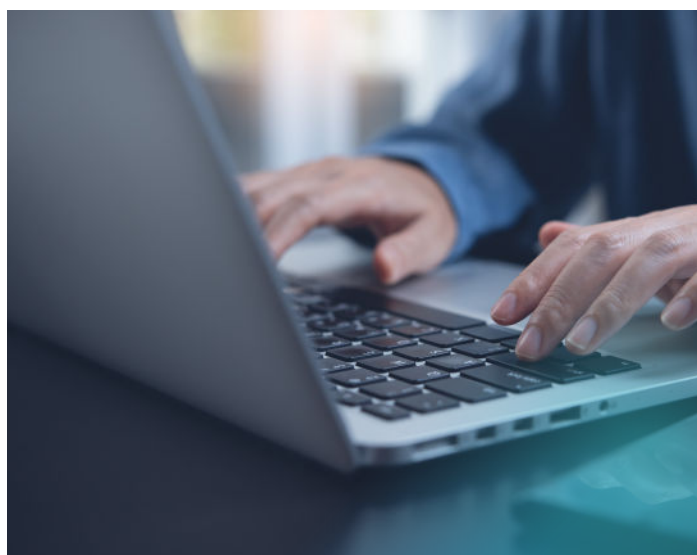
It's easy to draw an analogy between the physical world and the data world. Indeed, there are many similarities between the data products available in an EDM and real products distributed in a supermarket.

Just as products in a store are sourced from various suppliers, data products in an EDM are supplied by a variety of business domains. Similar to large-scale distribution, these domains must adhere to specific standards outlined by federated data governance.

Much like adhering to specific regulations to have products displayed on supermarket shelves, in an EDM, data products must be delivered by domains with detailed information regarding their quality, origin, and characteristics—akin to product packaging—as well as the security protocols governing their use and access. All of this vital information is recorded within the metadata of the data products.

A Necessary Federation of Domain Data Catalogs

In the Actian Data Intelligence Platform, the EDM relies on a fundamental notion—the federation of data catalogs. In this architecture, each business domain maintains its private data catalog, enabling the domains to optimally organize their data and circumvent the challenges associated with a universal metadata approach. The EDM serves as a dedicated component, allowing each domain to deploy the metadata of its data products.

Data catalogs should be integrated with the EDM to avoid redundant work in generating metadata—such as lineage, data dictionaries (schemas), or business definitions—that often span multiple domains. Federated catalogs may also need to be connected to each other to enable the sharing and synchronization of key information, especially business glossaries and select reference data.

This is the approach offered by the Actian Data Intelligence Platform. Its EDM is an extension of federated data catalogs—a simple and powerful approach in its conception and architecture (Figure 3).

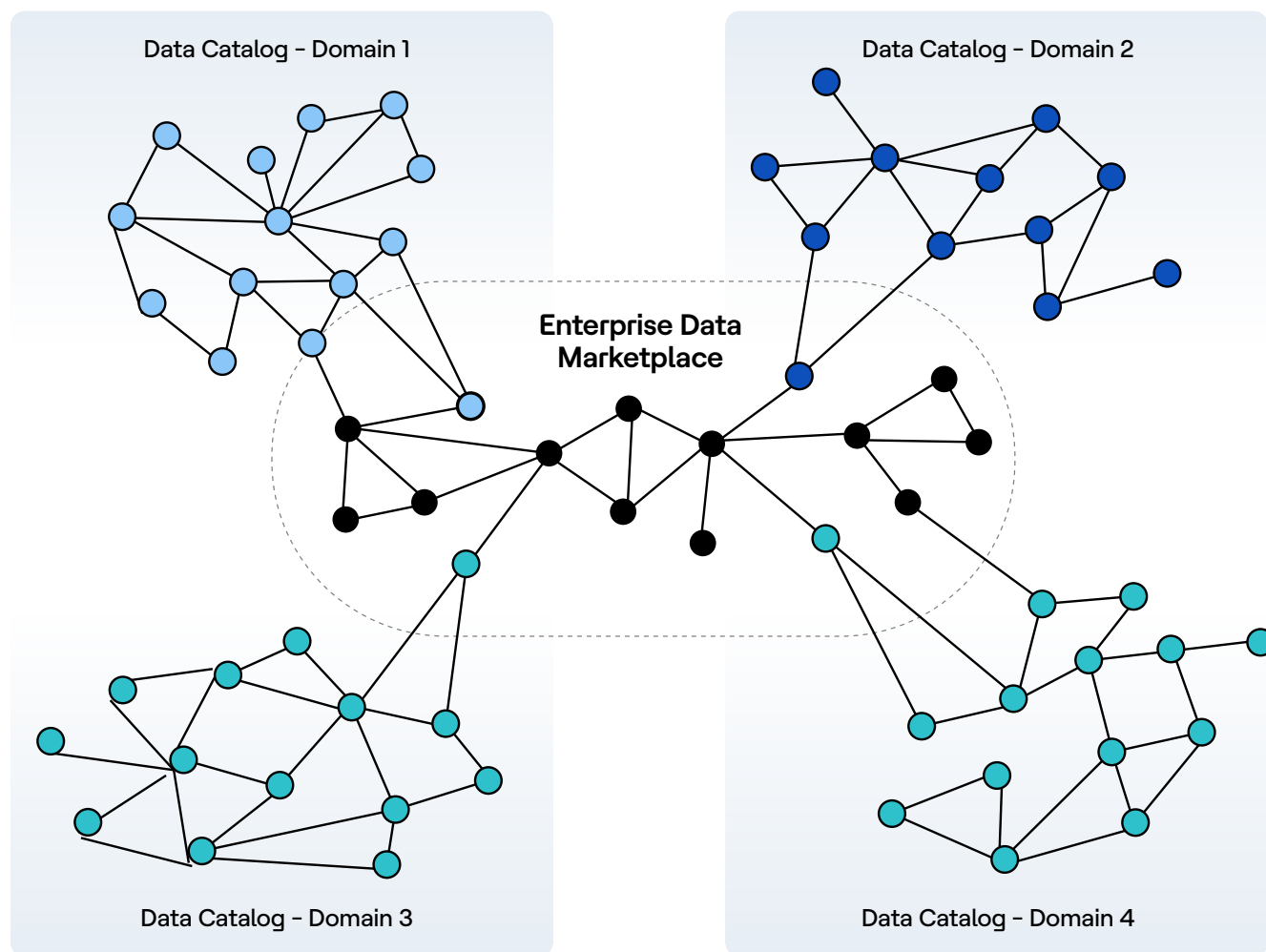**ACTIAN**™
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Figure 3: Federation of Domain Data Catalogs in the Actian Data Intelligence Platform EDM

Aligning with a core principle of the data mesh—delegating responsibility to data producers or business domains to provide reliable, up-to-date metadata for the data products shared in the EDM—the metadata production process is significantly transformed. The job of maintaining metadata from shared data products no longer falls solely on the data stewards of a central body.

Instead, multi-disciplinary product teams, particularly the engineering teams of the domains where the data is hosted, are entrusted with designing and populating the metadata. Much like retailers that require their suppliers to adhere to a set of specifications, a significant portion of metadata management is delegated to data engineering and development teams.

Reducing Time to Value by Easily Accessing Data

The decentralization of data, and consequently metadata, naturally parallels the evolution of data governance. A clear shift in data governance practices constitutes a foundational principle of the data mesh approach.

When organizations started documenting their available data, it was mostly limited to assets that were not widely accessible. With the advent of data catalogs, organizations attempted an industrial approach to reach a larger number of data consumers. However, this approach was still maintained by a central body.

The EDM and federated governance offer a solution. They meet user needs that are often underserved or not addressed by traditional data catalogs. Federated governance represents a restructuring of data responsibilities, drawing upon domain-specific expertise to gain a deeper understanding of the data assets' significance while adhering to centralized rules.

Delegating certain governance rules gives each domain autonomy to:

- Organize data as it wishes by defining a specific metadata model. Some elements of the model can be shared or imposed by governance rules.
- Integrate and ensure the feeding of its data catalog from the data sources it owns.
- Manage its users and their permissions.
- Identify the objects it wishes to share with other domains and control what information will be shared.

Centralized governance, on the other hand, is related to everything that's shared in the EDM, including large-scale data distribution specifications. For instance, similar to retail products, data products must furnish details on the underlying data's quality, origin, characteristics, and consumption rules that are aligned with company policies.

That's why Actian's EDM adapts to the organization. rather than the other way around. It offers implementation flexibility, whether the approach is centralized, semi-centralized, or completely decentralized.

Mandatory Automation Capabilities

Automation is crucial given the diversity and heterogeneity of the metadata that's intended to be published about an EDM's data products. Without it, the metadata may suffer from poor quality. It's important to differentiate between technical metadata and lineage metadata:

Technical Metadata

Technical metadata comes in three varieties:

- Automatically collected and maintained by the underlying data catalog
- Generated by data engineering teams specific to data products
- Available from other systems that needs to be integrated with the EDM

Harvesters or crawlers—tools used in data management to automatically discover, collect, and catalog metadata from various data sources—must gather information from these different sources. They include cloud platforms, ETL tools, and both modern and legacy on-premises technologies.

Data engineering teams document the metadata in preferred formats such as tables, XML files, and JSON. A platform should offer APIs and a software development kit (SDK) to facilitate the scanning of exposed metadata.

Lineage Metadata

An EDM cannot overlook its responsibility to furnish the origins of data products and must possess the capability to reconstruct lineage. Lineage diagrams should offer insights into the end-to-end transformations that are performed to generate consumable data products, encompassing inter-data product lineage information where dependencies exist.

This functionality is often lacking or not automatically provided in traditional data marketplaces and data catalogs. Conversely, an EDM built on robust data catalogs like the one offered by Actian effortlessly offers this capability.

A Federated Approach to Data Governance

In the data world, access control is a complex issue. This complexity arises from a fundamental reality—consuming data can be risky. However, to create value quickly with data, teams must be able to access it without delays.

In a decentralized environment—particularly within a data mesh framework—the data product owner responsible for governance and compliance should perform risk assessments and manage access through token allocation. This entails approving access requests and specifying any necessary data transformations to align with specific use cases. The process is known as policy enforcement.

In this context, access request technology must be agnostic. It should enable the activation of various data access methods, ranging from performing simple email requests using conversational tools to integrating with platforms already utilized in the workflow domain, such as ServiceNow or Jira. The technology should also integrate with data policy enforcement automation platforms.

It's important to note that many EDM vendors require companies to store their data within the vendor's infrastructure to enable access. Even when regulated, this approach often involves data transformations for storage—undermining the principles of decentralization.

A User Experience Worthy of the Name

One fundamental mistake by traditional data catalog vendors is assuming that a single platform can serve both data governance teams and end users. For instance, e-commerce giant Amazon's marketplace provides two distinct user experiences depending on whether someone is a consumer, which will use amazon.com, or a seller, which will utilize sell.amazon.com.

Similarly, in a data catalog or EDM, the user experience for those designing and documenting data products should naturally differ from experiences intended for those consuming the products. In this sense, the Actian Data Intelligence Platform was designed as an EDM with two specialized interfaces. Studio is the back-office application for managing EDM objects, while Explorer is dedicated to end users for data search and discovery.

Managing the Lifecycle of Data Products

Because a data product is an evolving artifact intricately linked with a plethora of data assets and other data products, the EDM must be capable of displaying data's evolutions over time at any given moment. This ensures that a consumer has visibility into data's history.

Visualization of Data Product Quality

As more data becomes accessible to a wider range of data consumers, the underlying quality of each data product becomes a critical pillar of data governance. While some data catalog vendors attempt to address this need, their solutions often fall short—highlighting the demand for specialized platforms dedicated to data observability and quality.

An EDM should seamlessly integrate with data quality management (DQM) platforms. It should also accommodate specific developments undertaken by data engineering teams, particularly for organizations that lack dedicated platforms.

A Platform Facilitating Collaboration and Measuring Data Product Value

While the value associated with each data product is crucial, it's often challenging to quantify. Therefore, an EDM should offer users a means to express perceived value through a ranking.

Additionally, data consumers should be empowered to provide suggestions for enhancing data products regarding quality, capacity, and coverage. This feedback mechanism is essential for increasing the popularity and adoption of data products by more teams.

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10 Tips for Successfully Implementing an EDM

Key success factors and best practices for implementing and optimizing an EDM include:

1. **Implement Agile Practices and Take an Incremental Approach**
   Adopt a value-focused approach and prioritize rapid time-to-value by adhering to the principle of taking baby steps. Focus on creating "most valuable products" (MVPs) rather than attempting to design all the required data products on day one.

2. **Take Inspiration from Product Design Principles**
   Form multi-disciplinary teams comprising product managers, business representatives, data engineering teams, and data infrastructure managers. Align them with established agile practices to facilitate collaboration and efficiency.

3. **Involve and Engage End Users**
   Involve end users early and consistently in the design of data products, particularly regarding the information they consider essential. This ensures that data products effectively meet their needs and expectations.

4. **Accept Controlled Governance Delegation**
   Leverage the principle of controlled delegation of governance to business units. The delegation should be tailored to fit each organization and culture.

5. **Delegate to Data Engineering Teams**
   Entrust to data engineering teams the responsibility of providing packaged and standardized information on data products. This helps streamline the data products' lifecycle.

6. **Monitor the Value Created by Data Products**
   Establish mechanisms to gather feedback from the field on observed contributions to monitor the created value from data products.

7. **Align the Data Strategy with the Business Strategy**
   Instill a robust culture of rights and responsibilities related to democratizing data access. This helps align the data strategy with the organization's overarching business strategy.

8. **Establish Management Meetings**
   Schedule required meetings for the highest level of management to ensure their understanding, involvement, motivation, and transparency regarding data products and EDM usage.

9. **Allocate Necessary Resources**
   Provide the necessary resources to support the strategic importance of becoming a data-driven company.

10. **Choose the Right Platform**
    Choose the right platform for the EDM. Ensure it provides the right user experience and capabilities to address and advance the organization's data needs.

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Overcoming Limitations of Traditional Data Catalogs with an EDM

The rapid evolution of the data management landscape demands innovative and flexible solutions. Traditional data catalogs, despite their initial promises, often fall short of meeting organizations' growing needs in discovery, governance, and data exploitation. The EDM offers a solution to modern challenges.

An EDM represents a significant advancement by allowing organizations to share data products efficiently and securely. It combines the benefits of modern data catalogs with essential additional features such as advanced search and discovery capabilities, flexibility in data product design, and federated metadata and data governance management.

By adopting an EDM, companies can improve data access and usage while accelerating value creation. The principles of decentralization, like those of the data mesh, are at the heart of this modernization, offering more agile governance adapted to the specific needs of different business domains.

Following best practices and drawing inspiration from product design principles is crucial to successfully implementing an EDM. Organizations can overcome traditional obstacles and fully leverage their data assets by involving end users, adopting agile practices, and choosing a suitable platform like the Actian Data Intelligence Platform.

Ultimately, becoming a truly data-driven organization involves reevaluating tools and approaches. A well-designed and carefully implemented EDM can transform how data is managed and used, paving the way for continuous innovation and informed decision making.

About Actian

Actian empowers enterprises to confidently manage and govern data at scale. Organizations trust Actian data management and data intelligence solutions to streamline complex data environments and accelerate the delivery of AI-ready data. Designed to be flexible, Actian solutions integrate seamlessly and perform reliably across on-premises, cloud and hybrid environments. Learn more about Actian, the data division of **HCLSoftware**, at **actian.com**.

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