

Hype Cycle for Data and Analytics Governance and Master Data Management, 2019

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Data and analytics leaders should use this Hype Cycle to understand the viability of the most hyped practices and technologies for data and analytics governance and MDM. Selecting the right decision and trust frameworks at the right time is key to realizing business value from information assets.

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Analysis

What You Need to Know

This Hype Cycle focuses on the disciplines of data and analytics governance and master data management (MDM).

By adopting the right disciplines and technologies at the right time, data and analytics leaders will be able to better realize business value from enterprise data, analytics and the business application landscape. The scope of governed data and analytics is enterprisewide, including ERP, CRM, data lakes, data science labs, analytics and artificial intelligence (AI).

Data and analytics leaders are faced with diverse digital business requirements on the one hand and increasingly distributed data and analytics on the other. Combined with disconnected business processes and silos, this makes it difficult to take strategic decisions based on trusted data, and results in greater inflexibility, complexity and cost to the enterprise.

To succeed with data and analytics initiatives, enterprises must develop a holistic view of critical technology capabilities. There are seven Hype Cycles for 2019 that cover the technologies, architectures and frameworks for data and analytics. Together, they contain the necessary elements for data and analytics leaders to form this holistic view.

Hype Cycles covering data and analytics:

- “Hype Cycle for Analytics and Business Intelligence, 2019”
- “Hype Cycle for Back-Office Analytic Applications, 2019”
- “Hype Cycle for Customer Experience Analytics, 2019”
- “Hype Cycle for Data Management, 2019”
- “Hype Cycle for Data Science and Machine Learning, 2019”
- “Hype Cycle for Enterprise Information Management, 2019”
- “Hype Cycle for Data and Analytics Governance and Master Data Management, 2019”

The Hype Cycle

Digital business continues to be a board-of-directors-level issue across the globe, with data and analytics taking the top spots on the list of game-changer technologies. Although there is no shortage of digital business technologies, data and analytics leaders struggle to scale them because their *business practices* — such as data and analytics governance and MDM — fall short of what is needed. As organizations then turn to practices, disciplines and technologies for data and analytics governance and MDM, in the expectation that adopting them will address their challenges, a cycle of “hype” is created.

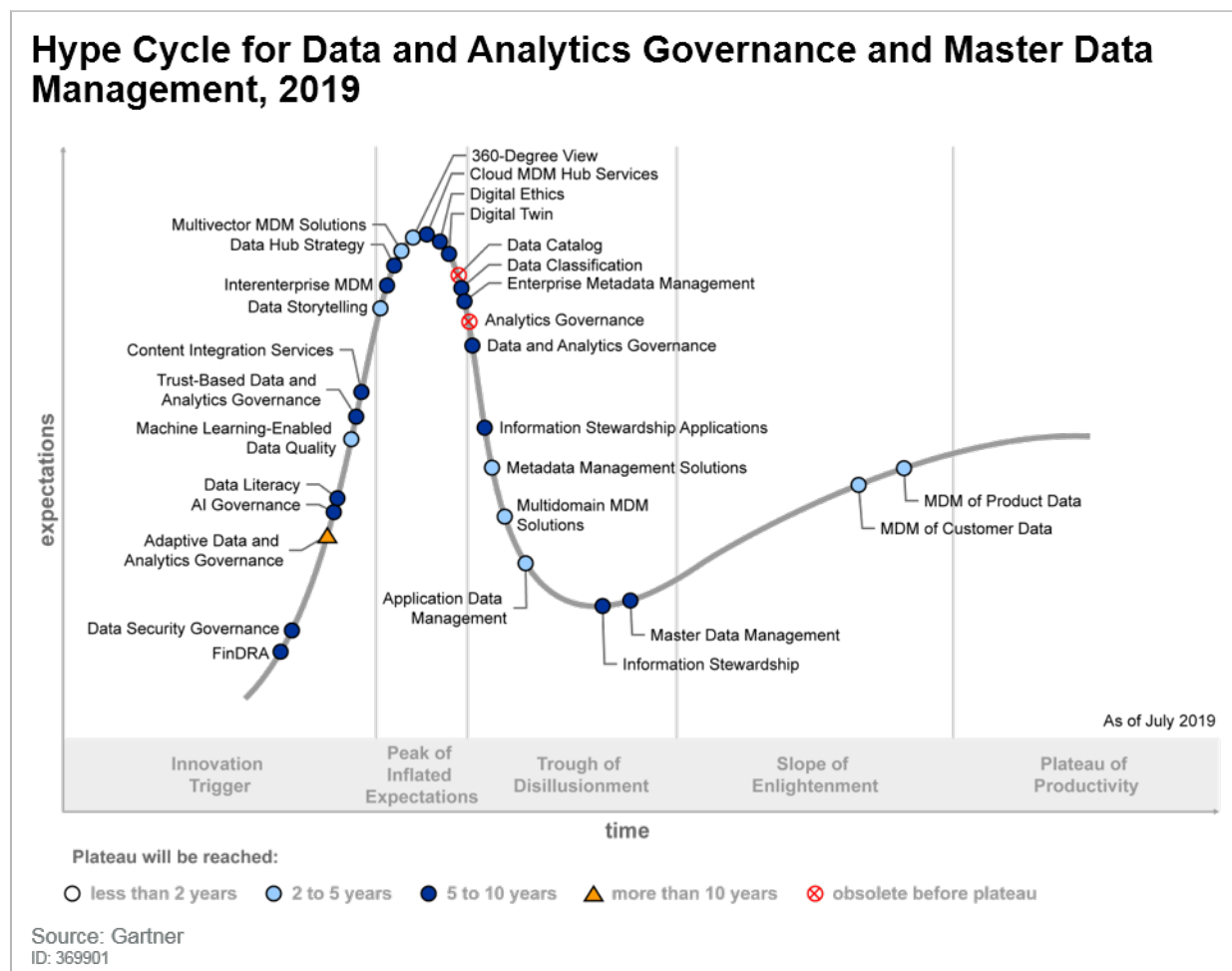
The innovation profiles in this Hype Cycle focus on discrete practices, disciplines, technologies and services in direct support of data and analytics projects, programs, products and services.

About three years ago, we saw the hype around data and analytics governance — as the long-awaited silver bullet to resolve the issues faced by data and analytics leaders — reach the Peak of Inflated Expectations. Since then, the realities of the practical challenges faced (such as culture) have seen expectations deflate and data and analytics governance hype slowly descend on the Hype Cycle.

Meanwhile, as digital business transformation initiatives gather pace, and newer areas such as AI and the Internet of Things (IoT) develop, we see organizations increasingly seeking to address these scenarios through agile and autonomous governance. As a result, we see adaptive governance, AI governance and trust-based governance gaining in market hype, as organizational interest and expectations accumulate and push these innovations further toward the peak of the 2019 Hype Cycle.

As organizations progress their MDM initiatives, we see the hype in related innovations, such as data hub strategy and 360-degree view, reaching their peak. In contrast, the growing organizational experience and market understanding of enterprise MDM solutions for product data and customer data has resulted in the hype for MDM of customer data and product data leveling off, as these solutions become more mainstream.

Figure 1. Hype Cycle for Data and Analytics Governance and Master Data Management, 2019



The Priority Matrix

A key objective of both data and analytics governance and MDM is driving increased business value of data and analytic assets through higher levels of oversight, integrity and trust. This, in turn, enables the realization of greater efficiency and productivity of established business processes, and also supports business growth.

Though data and analytics governance and MDM, along with associated elements, can be transformational for an individual organization, they have not as yet risen to exert a transformational influence on the market as a whole. We see convergence of the elements creating a high level of benefit to organizations over the next five to 10 years.

Given the prospective positive impact on organizations, our recommendation is to focus on those elements that are projected to reach the Plateau of Productivity within two to five years. Pay

particular attention to multidomain MDM solutions, metadata management solutions, machine-learning-enabled data quality, and application data management.

More-complex innovations also hold the promise of high benefit to organizations, albeit on a longer time horizon. However, the foundations required for an organization to benefit from these need to be assessed and laid down in advance of their maturation to the Plateau of Productivity, to realize maximum benefit. More importantly, organizations seeking competitive advantage by means of data should begin to actively investigate and assess these innovations for integration into their business value chains.

Figure 2. Priority Matrix for Data and Analytics Governance and Master Data Management, 2019

Priority Matrix for Data and Analytics Governance and Master Data Management, 2019				
benefit	years to mainstream adoption			
	less than 2 years	2 to 5 years	5 to 10 years	more than 10 years
transformational			Data Security Governance Digital Twin FinDRA	Adaptive Data and Analytics Governance
high		360-Degree View Data Storytelling Machine Learning-Enabled Data Quality MDM of Customer Data MDM of Product Data Metadata Management Solutions Multidomain MDM Solutions Multivector MDM Solutions	AI Governance Content Integration Services Data and Analytics Governance Data Classification Data Hub Strategy Data Literacy Digital Ethics Enterprise Metadata Management Information Stewardship Information Stewardship Applications Interenterprise MDM Master Data Management Trust-Based Data and Analytics Governance	
moderate		Application Data Management	Cloud MDM Hub Services	
low				
As of July 2019				
Source: Gartner ID: 369901				

Off the Hype Cycle

The following innovation profiles have been removed from this Hype Cycle:

- **File analysis:** In the context of data and analytics governance and MDM, we have seen the hype for file analysis drop and, instead, be replaced by growing interest in content integration services. This is consistent with the increasing maturity in this area, as appetite and interest expands to better incorporate and govern enterprise content.

On the Rise

FinDRA

Analysis By: Brian Lowans; Khushbu Pratap

Definition: A financial data risk assessment (FinDRA) provides a method to prioritize financial investment opportunities for data based upon monetization options against business risks. Infonomics will help distill the financial impact of business risks caused by security, compliance or processing incidents.

Position and Adoption Speed Justification: Every digital business is experiencing explosive growth in velocity, volume, variety and untapped value opportunities for data. But this explosion is accompanied by prolific growth of business risks that create financial impacts. Unfortunately, business leaders continue to separate the decision processes for data investments and monetization opportunities from the associated costs or liabilities. FinDRA is an early-stage methodology that can be used jointly by business leaders such as the chief data officers (CDOs) and the chief information security officers (CISOs). It provides a strategic opportunity for CISOs to use data security governance (DSG) and create a defensible strategy and budget for data security and data management.

User Advice: There is rarely, if ever, any discussion about the financial impacts that can result from investment decisions on how to use data. Therefore, the opportunity costs (liabilities) are not assessed, resulting in overly optimistic financial forecasts. An incident such as a data breach, privacy enforcement, noncompliance or even accidental processing incidents can create financial impacts to a business in different ways that can be short-term “volatile” or longer-term “persistent” costs. Infonomics allows a CISO or CDO to evaluate the tangible and intangible costs of managing, storing, analyzing and protecting the data as part of a five-step process for FinDRA:

1. Establish a DSG framework to identify and manage business risks.
2. Identify each dataset and its ability to affect revenue or asset value.
3. Map data assets, access controls and apply a data risk assessment (DRA) to identify gaps in how data security is applied.
4. Identify how gaps create business risks and prioritize them using FinDRA.
5. Establish a defensible budget for an evolving data security strategy.

The relative financial impacts can be represented by a financial risk prioritization that compares “asset” value against “liability” value. An investment decision can then be prioritized according to relative ratios of assets and liabilities, opportunity cost, return on investment etc. This allows for a relative comparison of how business initiatives affect each dataset, and a prioritization can be created for investment or for incurring a reactive cost, for example, in terms of security or divestment. The aim of this approach is to create a relative evaluation of datasets instead of an actuarial calculation.

Business Impact: The ability to assess, prioritize and then mitigate selected business risks associated with data management and monetization projects will be transformed by FinDRA. Digital business organizations have an opportunity to use FinDRA as a repeatable, consistent methodology to enable direct collaboration between CISOs and other business leaders such as the CDO to create data security and data management strategies with Board-level approval of defensible budgets and investments.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Corax; Emergynt; Guidewire; Nehemiah Security; RiskLens

Recommended Reading:

“Use Infonomics to Reset Data Security Budgets”

“Develop a Financial Risk Assessment for Data Using Infonomics”

“How to Use the Data Security Governance Framework”

“CIOs Must Ensure CFOs Account for the Value of Digital Business”

“Innovate New Financial Methods for Digital Business”

Data Security Governance

Analysis By: Brian Lowans

Definition: The data security governance (DSG) framework enables the assessment, prioritization and mitigation of business risks caused by noncompliance, security or accidental incidents affecting data. DSG provides a balance between the need to maximize competitive advantage and data monetization options, while setting appropriate budgets for security to mitigate those prioritized business risks.

Position and Adoption Speed Justification: The DSG framework offers a balanced approach to define how practical security can be implemented through data protection and privacy security controls. Each dataset is different, and the business risks urgently require the CDO and CISO teams to provide higher levels of cross-communication and collaboration, and break down barriers of

independent governance processes. The rapid emergence of data protection and privacy regulations also requires collaboration with the data protection officer (DPO) to ensure new data protection and privacy requirements are integrated into DSG.

User Advice: The DSG framework is constructed to manage security choices across a portfolio of datasets. The flow and analytics applied to each dataset will create policy decisions based upon privacy, confidentiality, integrity, availability, ethics and lifetime issues. Many Gartner clients start with tactical questions or best practices for a particular vendor security product, or how a particular product can help meet compliance with a regulation. This is the wrong place to start in DSG. Each product option is siloed in the security functionality, the controls it offers and/or the data storage on which it operates. No single security control will mitigate a business risk. Therefore, DSG is critical to assess what the product controls, in context with the security control gaps it does not provide, and to identify the requirements for other compensating controls. These gaps create the need to develop a basic data mapping of existing security controls. This also establishes the need for a continuous data risk assessment (DRA). The DRA should monitor, for example; changes to the enterprise data management architecture created by new regulations, changing security threats, business decisions to acquire new applications, IT infrastructure and changes to access by the data owners. The DRA forms the basis for assessment and creation of security policies that are required under DSG. They are based around three basic principles:

- Data — Many different datasets are in use and managed by business leaders as part of a data catalog, analytics or part of a business process.
- User Account — Each user account will be granted a variety of roles and affiliations to project teams, devices and IT. User accounts are also being provisioned for access by programmable devices and AI.
- Access — A variety of products provision access, privileges and entitlements that are encompassed by data security, identity access management (IAM) and, applications or analytics.

Orchestration of policies across the variety of data security, IAM and application management consoles is a complex process. There are some core principles that help:

- Identify and map all data storage and processing silos on-premises and in cloud services.
- Identify all products that manage access to, or security of, data.
- Identify the data discovery and classification products deployed and their ability to cover unstructured and structured data.
- Identify which datasets and volumes are stored in each silo.
- Identify which datasets are encompassed by each security console.
- Map which users and privileges are granted by each console.
- Create an analysis to identify inconsistencies or gaps in each user's access to datasets.
- Identify potential roadmaps to synchronize and orchestrate more-consistent policies.

- Identify gaps and risks created by the existing product portfolio that cannot be addressed by orchestration and recommend changes.

The business risk analysis process can then evaluate the impacts of specific monetization options and innovations using infonomics to estimate profitability in terms of financial assets and liabilities. Prioritization of these opportunities can then be established using principles such as Gartner's financial data risk assessment (FinDRA). Any broader data and analytics governance effort needs to align to DSG since the two approaches look at applying policies to the same piece of data, possibly in the same time and space. Therefore, cooperation and collaboration between CDO and CISO is essential to reduce redundancy and waste.

Business Impact: Enterprises focused on digital business strategies are seizing tremendous opportunities for growth and data monetization by creating value from the increasing velocity, volume and variety of datasets. However, they face huge challenges to mitigate growth in associated business risks because mitigation of business risks arising from security and compliance issues and data monetization have split responsibilities. Additional security, privacy, trust and ethical issues grow as data is also shared with business partners and other data ecosystems. Current data security strategies do not address these business risks pervasively. Gartner's DSG framework is a new way to assess the business risks and to deploy the additional principles of infonomics and FinDRA to begin to prioritize these risks.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Recommended Reading:

"How to Use the Data Security Governance Framework"

"CISO Playbook: Adapting to the Changing Regulatory Environment"

"How to Align Enterprise Data Security Initiatives With Overall Data Governance"

"Use Infonomics to Reset Data Security Budgets"

"Develop a Financial Risk Assessment for Data Using Infonomics"

Adaptive Data and Analytics Governance

Analysis By: Saul Judah

Definition: Adaptive data and analytics governance is an organizational capability that enables context-appropriate governance styles and mechanisms to be applied to different data and analytics scenarios in order to achieve desired business outcomes.

Position and Adoption Speed Justification: As organizations accelerate their digital business initiatives, ecosystems and platforms, their ability to deliver expected business value is limited by

their current business practices — in particular, their governance of data and analytics. Although there is greater diversity and complexity in business scenarios than ever before, data and analytics governance has typically continued to adopt a single, control-oriented approach. Organizations are beginning to recognize that this is no longer adequate, and demanding elastic, context-specific governance practices that can better address their dynamic ecosystems.

Adaptive data and analytics governance is a response to the growing diversity and complexity of business scenarios with a critical dependency on data and analytics.

This approach enables different governance styles (control, outcome, agility and autonomous) to be applied to the data and analytics scenario needed to enable delivery of the business outcome. For example, a control-oriented style may be appropriate in a regulatory situation (where master data is involved), whereas an autonomous style may be more suitable in an IoT scenario. As organizations continue to invest in data and analytics to address their business challenges (e.g., changing competitive landscape, new technology opportunities, new regulations), the hype for adaptive data and analytics will also increase.

User Advice: Data and analytics leaders driving data and analytics governance programs should:

- First, use the data and analytics IT Score to evaluate their maturity and readiness to undertake changes to their governance capabilities. They should not attempt to establish agility and autonomous governance if there is no existing foundation for control- and/or outcome-based governance.
- Reevaluate the existing and emerging business scenarios and assess how their current data and analytics governance framework supports or will support these.
- Create a proof-of-concept initiative that tests the applicability of one of the more advanced governance styles (e.g., autonomous) in their environment, and evaluate the business outcomes and value, emerging risks, technological limitations and the cultural barriers to wider adoption.
- Engage with the senior business executive leadership to discuss the results of the POC and develop a business case and strategic roadmap for establishing adaptive data and analytics governance.
- Establish first the Control and Outcome styles of adaptive governance, before evolving to the Agile and Autonomous styles. Proceed on the basis of “minimum governance,” focusing on limiting the scope of data, analytics and business processes to those that deliver greatest business value and organizational outcomes.

Business Impact: Adaptive data and analytics governance has the potential to be one of the enablers for successful digital business transformation. Today, many enterprises continue to use the same hard-wired governance approaches to their data and analytics: most commonly, this is the control-oriented governance approach. More enlightened organizations are also using outcomes-oriented frameworks that address decision frameworks, compliance, risk and investment management to support corporate objectives. Sometimes, these are further extended to address innovation scenarios, and we see bimodal approaches included in governance frameworks. What has been missing, however, is a flexible framework for applying different governance styles for data

and analytics initiatives dependent on business context that is faced by the enterprise. Organizations that are able to embrace this successfully will be able to accelerate deployment of their data and analytics initiatives, allowing the enterprise to faster respond to business opportunities and become more competitive and risk-aware.

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Recommended Reading:

“Use Adaptive Governance for Data and Analytics to Drive Digital Business Success”

“5 Steps to Build a Business Case for Data and Analytics Governance That Even Humans Will Understand”

“IT Score for Data and Analytics”

“Design an Effective Information Governance Strategy”

“Succeed With Digital Business through Adaptive Governance”

AI Governance

Analysis By: Svetlana Sicular; Frank Buytendijk

Definition: AI governance is the process of creating policies, assigning decision rights and ensuring organizational accountability for risks and investment decisions for the application and use of artificial intelligence (AI) in the context of predictive models and algorithms. AI governance is part of adaptive data and analytics governance. It addresses the perceptive, predictive and probabilistic nature of AI.

Position and Adoption Speed Justification: AI has emerged from the domain of scientists and researchers with little interest in the effects of AI upon the enterprise, such as AI governance. With AI having now reached the perimeter of practical enterprise application, data and analytics leaders are asking how to balance the business value promised by AI against the need for appropriate oversight, risk management and investment management. Enterprise practitioners are already making steps toward establishing AI governance. New organizations — like the AI Now Institute and Partnership on AI — are becoming prominent in fighting AI-related biases, discrimination and other negative implications.

User Advice: To develop AI governance, data and analytics leaders, CIOs and CDOs should actualize the framework of trust, transparency and diversity to meet the new, AI-specific challenges and considerations. This framework should extend and advance existing governance mechanisms, such as risk management or data and analytics governance.

- Focus on trust in data sources and AI outcomes to ensure successful AI adoption. Develop specific testing and ethical guidelines for “life-critical AI” that encompasses physical or moral safety.
- Identify transparency requirements for data sources and algorithms. Promote transparency of AI solutions and communication around AI to minimize different interpretations of AI results.
- Favor diversity, not just in terms of people’s minds, backgrounds and cultures, but also in terms of data selection and algorithm choices. Demand new, different and even contradictory data to combine with what you already use to minimize the risk of AI biases.

Establish use-case-based accountability for AI solutions, outcomes and ethics. Develop methods for proactive regulatory compliance and outline reactive responsibilities, actions and procedures in the case of unanticipated and unintended consequences.

Plan adaptive governance to support freedom and creativity in data science teams, but also to protect the organization from reputational and regulatory risks. Little or no governance in data science teams to facilitate freedom and creativity is an acceptable approach if this is a conscious governance decision.

Business Impact: AI governance does not necessarily mean command and control; rather, it means:

- Ethical and safety principles, together with mechanisms to ensure their adherence.
- Trust and transparency mechanisms to reach a common understanding of data and algorithms that are used for AI.
- Diversity mechanisms to ensure the right data, algorithms and team members for each AI project.
- Nonprohibitive guidance on the standards for AI technologies, to avoid proliferation of tools in the absence of such standards.

Unfortunately, most enterprises currently neglect AI governance, unaware of the potential regulatory and reputational risks and possible governance approaches.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Recommended Reading:

“AI Governance Spotlight: Early Lessons and Next Practices”

“Build AI-Specific Governance on Three Cornerstones: Trust, Transparency and Diversity”

“Seek Diversity of People, Data and Algorithms to Keep AI Honest”

“Governance and Best Practices for Chatbot Development”

“Healthcare Provider CIOs: Get Ahead of AI Innovation With Strong AI Governance”

Data Literacy

Analysis By: Valerie Logan; Alan D. Duncan; Sally Parker

Definition: Gartner defines data literacy as the ability to read, write and communicate data in context, with an understanding of the data sources and constructs, analytical methods and techniques applied, and the ability to describe the use-case application and resulting value.

Position and Adoption Speed Justification: A major inhibitor of the measurement, management and monetization of information assets is that creators and consumers of data and analytics capabilities face a language barrier. Due to ineffective communication, a lack of analytical and critical-thinking skills and limitations of organizational culture, they often struggle to make a business more “data-driven” because they do not “speak data” consistently. Respondents to Gartner’s third and fourth annual Chief Data Officer Surveys ranked “poor data literacy” among the top-three internal roadblocks to success. They also identified cultural issues and a lack of talent and skills as major impediments to business growth.

Data literacy is a core enabler of digital business — alongside people, processes and technologies. Data literacy should be viewed as a central pillar of broader digital dexterity or digital workforce transformation efforts. Awareness of the data literacy challenge is increasing, with a growing number of organizations planning and delivering specific data literacy programs. However, as yet, only a few providers of data literacy assessments and training have emerged. The lack of common models/frameworks and localized training approaches are major obstacles in the way of rapid and widespread adoption. Additionally, the lack of comprehensive data literacy programs, standards, training and certification inhibits awareness and adoption.

User Advice: Increased demand for “data-driven” business and growing awareness of the need for data literacy and deliberate competency development are prompting leading organizations to pilot data literacy initiatives by, among other things, working with emerging providers of data literacy offerings. Given the limited number of providers, data and analytics leaders should begin data literacy workshop and training pilots of their own, which should include examples of the use of data storytelling and decision models to convert conversations into business-oriented dialogue. Despite the small number of providers in the market at present, offerings are developing rapidly as consulting services, providers of self-service and citizen data scientist software tools, and boutique firms emerge to address the demand within the next 18 months. Universities will also rapidly expand relevant courses to fill the talent gap. The general rate of adoption will be measured in years, though, much as Six Sigma that took years to achieve widespread adoption, and we expect data literacy to move only slowly along the Hype Cycle.

Pilot any of the following to get started:

- Data storytelling, to employ more narrative, visual formats and outcome-oriented emphasis.

- Decision modeling, to shift the conversation from self-service tools and dashboards to related decisions and actions.
- Outcome-driven data and analytics initiatives, to shift the conversation from data and analytics capabilities to the organizational outcomes that they help deliver.

Data and analytics leaders should explicitly champion data literacy. Partner with company's executives who "get it" and care about data literacy, data-driven culture and data monetization. Champion data literacy, data-driven culture and infonomics concepts with senior management to drive investment in relevant employee awareness and education programs. Use the people and organization dimensions of Gartner's IT Score model for data and analytics to provide context for data literacy efforts within your organization and work with human resources to develop a pilot data literacy training program. Strive to tie measurable business objectives to improved data literacy and to employee development and appraisal programs.

Services firms, software providers and others should align existing training and self-service enablement efforts with a broader curriculum and portfolio of data literacy offerings to meet the data literacy needs of both consumers and creators of data-driven solutions.

Business Impact: Developing data literacy is an imperative for any organization desiring to derive value from data. It is required across all industries, business domains and geographies, and will benefit any business process, role and decision where there is the opportunity to measure, manage and monetize data. Similar to the maturation of Six Sigma in the 1990s as a core competence, data literacy will impact all employees, from the board room to the break room, by becoming not just a business skill but a critical life skill.

Creators and producers of data, analytics and artificial-intelligence-based solutions will benefit from:

- A clear business context for analytics. This will help them understand how to ask a good question and apply critical thinking.
- A shared understanding of data sources, data quality and data elements across data types.
- An appropriate degree of understanding of the array of analytical methods available for measuring, monitoring and analyzing datasets in order to derive insight, and inform decisions and actions.

Data literacy can be framed as an important component of a broader workforce digital dexterity campaign, to help employees boost their ambition and ability to use data and technology in pursuit of better business outcomes.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Accenture; Ambient Intelligence; AVADO; Cognizant; Data to the People; Experian; Pluralsight; Qlik; Tableau; Tuva

Recommended Reading:

“Information as a Second Language: Enabling Data Literacy for Digital Society”

“Fostering Data Literacy and Information as a Second Language: A Gartner Trend Insight Report”

“Getting Started With Data Literacy and Information as a Second Language: A Gartner Trend Insight Report”

“Toolkit: Enabling Data Literacy and Information as a Second Language”

“How CDOs Engage With Their Stakeholders to Foster Data Literacy and Deliver Measurable Business Value”

“Artificial Intelligence Demands That CIOs Foster a Data-Literate Society”

“Data-Centric Facilitators Are Crucial for Enabling Data Literacy in Digital Business”

Machine Learning-Enabled Data Quality

Analysis By: Melody Chien; Saul Judah

Definition: Machine learning-enabled data quality is the application of self-learning algorithms that are focused on data quality improvement. Most commonly, it is offered by vendors in their data quality tools, packaged as data quality functionality (e.g., standardization, matching, merging) that is augmented by machine learning. For example, via a user interface, business users can train machine learning algorithms to learn from human data stewards. The best suggestion can be made available to users the next time for proper rules for standardization.

Position and Adoption Speed Justification: As organizations accelerate their digital transformation initiatives and take advantage of the huge number of data assets available to their enterprise, the challenge of managing trust-at-scale has increasingly become a limiting factor. While the connection between the quality of data and good decision making, process efficiencies, reduced risk and increased revenue is understood, the ability of existing data quality tools and practices is rapidly diminishing.

Vendors of data quality tools have recognized this and have responded by augmenting and extending their existing data quality capabilities with machine learning. For past year or two, we have seen some vendors provide machine learning support for functionality such as standardization, cleansing and matching to bring automation for greater productivity. We are expecting to see a broadening out of this support to other areas such as profiling, business rule auto suggestion, enrichment and automatic issue resolution workflow. As machine learning augmented data quality continues to develop, it is possible that end users will see some occurrences of functionality conflict, as providers in adjacent markets (e.g., metadata management) also seek to extend their capabilities with machine learning. While data quality tools have become mainstream, innovations such as data quality machine learning are emerging and we expect the hype for this to rapidly increase in the market in immediate future.

User Advice: Organizations faced with challenges of scale and distribution of their data should first assess the existing machine learning capabilities within their data quality tool, if they have one. Starting first with existing use cases, an assessment of how their data quality tools and practices are applied and their limitations in addressing large, complex, distributed, and fast datasets (e.g., streamed data) must be understood. Then, opportunities to close this gap by leveraging the machine learning functionality, where it exists, must be explored. Work with vendors to explore their machine learning capabilities, and determine skills, processes or training required to implement the features. Depending on vendors' technology maturity, it's very likely that some degree of custom development may be required to fully leverage the features.

Some organizations may discover that their data quality tools provider does not provide machine learning components within their offering. In such cases, if the opportunity cost of not having machine learning augmented data quality tools is low or the business requirement is not immediate, discussions with the vendor to understand what will be offered and when it will become commercially supported should take place. However, if the opportunity cost is high and the business requirements make machine learning supported data quality improvement a high priority, immediate discussions with the vendor should be initiated and architectural options evaluated.

Business Impact: As organizations accelerate the pace of change and seek to exploit new markets, the complexity of its operations and the creation and consumption of huge and diverse datasets will increase. This means that the need for good data quality is greater than ever. Without machine learning, existing data quality practices and the tools that support them are simply inadequate. Therefore, organizations that are quick to exploit data quality machine learning are likely to have a greater competitive advantage with greater automation and future insights. However, because the risk associate with adoption of machine learning for data quality is also commensurately large, it is imperative that organizations also step up their game in the governance of their data and analytics, and metadata management.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Ataccama; IBM; Informatica; MIOsoft; Oracle; SAP; SAS; Syncsort; Talend

Recommended Reading:

“Critical Capabilities for Data Quality Tools”

“Magic Quadrant for Data Quality Tools”

“Toolkit: RFP Template for Data Quality Tools”

“Preparing and Architecting for Machine Learning”

Trust-Based Data and Analytics Governance

Analysis By: Andrew White; Saul Judah

Definition: A trust-based data and analytics governance model describes and reports the desired and actual trust, reliability and efficacy one sees in data, systems, partners and organizations, so that the data is fit for purpose. This trust-based model differs from past governance models that seek to focus on truth-based policies that “clean and converge” data on a single definition compared to a more graduated model that looks instead to various levels of trust based.

Position and Adoption Speed Justification: Hype around trust in data and analytics is moving swiftly; vendors are promoting such capability without really offering much in reality. The hype is being driven mostly from the analytics, machine learning and AI space, where the volume of data, or the lack of data, lead to a discussion of trust in the data, or the source from whence it came. The existing approaches taken by data quality, metadata management, information stewardship, master and application data management (MDM, ADM), and governance-supporting technologies are ineffective as they tend to focus on truth-based approaches with explicit and black and white policies and rules; such solutions still do not support a graduated, and automated, approach to determining trust, and defining trust.

Business stakeholders and/or users are coping with the challenge manually and some are struggling to do so; thus, we expect trust models to move from manual efforts into programmable and repeatable technology tools in the next two to five years.

We have seen some trust-based approaches in a few key situations, often related to intelligence work, but they are very manual and technology vendors have yet to operationalize support for the need. This will come in time.

User Advice: D&A leaders driving data and analytics governance programs (such as MDM, analytics governance, AI model governance, information stewardship, or application data management, etc.) should:

- Familiarize themselves with the information trust model frameworks that can be applied in evaluation of data and their sources, including systems and organizations.
- Apply considerations of trust to existing data domains that are critical within the organization to support a graduated cost-benefit use of data to increase flexibility and agility and more scalable approach of data and analytics governance.

Many organizations are still very immature when it comes to modern data and analytics practices. As such, trust models may seem somewhat aspirational or too far out of reach. It is more important to realize that the entire space continues to evolve, and hard-wired approaches are not flexible enough. As such new models, like trust models, may add some flexibility.

Business Impact: The work of setting, interpreting and enforcing data and analytics governance policy to date has tended to focus on absolute truths and the desire to control and adjust (e.g., clean) data. This works reasonably well when scale and complexity is low. As the scale of what is being governed and complexity increases, such approaches do not work as well. As such

processes and practices related to the work of D&A governance, and how technology is applied, will also change. Much of these is very new and so far, not widely available or seen.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Recommended Reading:

“Reset Your Information Governance Approach by Moving From Truth to Trust”

“Use a Digital Trust Index to Maximize Digital Business Performance”

Content Integration Services

Analysis By: Marko Sillanpaa

Definition: Content integration services are technology that provides a single point of access, a unified interface, common functionality and consistent governance to federated content sources residing in dispersed and disconnected repositories. This differs from enterprise search by extending information discovery to bidirectional integration, updating content, and delivering capabilities to other repositories. For example, content integration services can bring workflow and metadata capabilities to a simple file system.

Position and Adoption Speed Justification: Increased demand from business users for content-centric solutions that solve specific business problems as created by numerous new content silos. When combined with entrenched content services platforms, it creates a complex sprawl of disjointed content silos. Content integration services have emerged to address this uncontained sprawl. Providers have focused on four areas:

- Content services platform vendors — Provide a common set of cross-vendor functional capabilities. These vendors provide consistent workflows and modern integrations for business users.
- Content collaboration platform vendors — Enable sharing while providing an additional security layer to cross-vendor sources. These vendors allow for synchronizing content across third-party mandated collaboration platforms.
- Records management vendors — Provide records and retention controls to multiple, disparate content repositories from a central console. These vendors often provide more functionality than the source repositories they manage.
- Content migration vendors — Provide a variety of integrations on a core platform based on configuration. These vendors provide high-performance migration with audit capabilities.

Previous attempts at standardized content integration services met with limited acceptance due to varying levels of support by platform vendors. The new wave of content integration technologies

from companies like Simflofy, SkySync and Xillio are not constrained by standards bodies and can add new functionality as needed. These vendors are provisioning and maintaining a comprehensive set of connectors for the ever-growing number of repositories. While content integration services is climbing the Innovation Trigger, there are risks ahead. Case studies are still thin on the ground and without real investment, it may fall off before reaching the Plateau of Productivity.

User Advice: Application leaders should:

- Be aware that many of the products in this sector are new and therefore entail some implementation risk. Kick-start repository integration programs with proofs of concept or pilot initiatives, and tackle a use case that covers most of the requirements needed. For organizations with fluid content ecosystems, prioritize vendors that focus on providing a layer of abstraction to eliminate the complexity of having to build yet another connector as a new repository or version appears.
- Match the primary focus of the integration service to your business requirements. A platform that is primarily aimed at information governance is not a good match for integrated BPM requirements, and vice versa. Determine the high-priority business requirements for the integration and select vendors that address those requirements as a primary function. This is a fast-developing area in which most vendors are looking to expand their solutions beyond their initial point of entry and are likely to provide more wide-ranging capabilities in future.
- Use integration services to provide access to legacy content silos. For example, as a temporary alternative in cases where migrations have stalled due to complex integrations with legacy applications.

Business Impact: Content integration services provide the ability to pull together many sources of content within an organization and impact its content services strategy. Using content integration services, organizations will achieve a more agile content strategy that enables best-of-breed, business-focused technology selection. And one that provides managed access to all content and holistic information governance capabilities from a central location, instead of a single platform approach, which has been unsuccessful to date.

Connecting content sources and providing distributed access to end users in a seamless manner provides many benefits, such as increased regulatory compliance and access to analytics and machine learning. As a result, content integration services will support innovation, governance and cost reduction initiatives by optimizing information assets for availability.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Citrix; Egnyte; Everteam; Gimmal; IBM; M-Files; SER Group; Simflofy; SkySync; Xillio

Recommended Reading:

“Control Content Sprawl With Federations”

“Reinventing ECM: Introducing Content Services Platforms and Applications”

“What You Need to Know About Content Services Platforms”

“Extend Content Services Platforms With Applications and Components to Meet Business-Specific Needs”

At the Peak

Data Storytelling

Analysis By: James Richardson

Definition: Data storytelling combines interactive data visualization with narrative techniques to deliver insights in compelling, easily assimilated forms. Analytic data stories are intended to prompt discussion and drive collaborative decision making, while journalistic or reportage style data stories aim to inform or educate, often using infographics. Both commonly link data and time or events via a narrative story arc.

Position and Adoption Speed Justification: Data stories offer a compelling combination of capabilities that help people to better engage with data. Most analytics and BI platforms now include basic functionality to create and share data stories. These stories can take several forms, most frequently data-connected slideshows or storyboards, and annotated dashboards, and occasionally more graphic design style infographics. As the use of self-service analytics matures, users are beginning to use data storytelling tools and techniques to better communicate data findings to decision makers. However, although enabled by new functional capabilities, the outcome of data storytelling draws much more an emergent set of skills, practices and behaviors around how data is socialized and used in organizations. Today, most data stories are being told by analysts, but machine-driven data storytelling (via applied ML) is emerging, offering the promise of news-style headlines and narratives generated automatically and specifically for individuals. Data storytelling is part of a broader movement oriented around data literacy and explaining and expressing data and analytics in a business-friendly and relevant way.

User Advice: Data and analytics leaders should:

Evaluate and experiment with the data storytelling capabilities of analytics and business intelligence platforms. In particular, examine how their incumbent portfolio of technologies supports the creation of a storyboard style presentations with embedded analytical content.

Task members of their Analytic Community of Excellence (ACE) to investigate data storytelling as an extension to their use of interactive visual exploration and analytic dashboarding, in order to provide a richer delivery of information by adding narrative and context.

Prepare programs to develop and instill the particular mix of data visualization design, narration and presentation skills needed to support effective data storytelling. Identify a team of business analysts and citizen data scientists to act as a virtual team of data storytellers.

Appraise your organization's managerial and decision-making culture, and assess data literacy as an overall capability, by running pilot assessments and workshops in selected lines of business and identifying areas for targeted training and development.

Business Impact: Too many decision makers still overlook, ignore or avoid the data insights delivered to them. This can be a cultural issue; however, there is also a simpler factor at play, how data insights are delivered. In many cases, even where the insight does spark interest it may lack the context required to drive a decision. Data storytelling can help break down managerial inertia and apathy toward data by adding context and making it more accessible. The business impact of data findings delivered as a story can be much higher, as story is familiar to all. A data storytelling led approach can transform how analytics and data science teams work by getting them to focus on how their audience, often nontechnical decision makers, need data to be presented to them to be most compelling.

From an ROI perspective, the use of data storytelling functionality can help drive adoption of A&BI technology, by repositioning how these tools are used from simply visualizing data to becoming as the key medium for the effective communication of insights about data. This is important when Gartner research shows that adoption of A&BI platforms is still less than it should be to be of most impact.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Information Builders; MicroStrategy; Qlik; Tableau Software; Toucan Toco; Workday (Stories.bi); Yellowfin

Recommended Reading:

"Beyond BI Reporting: Engaging Decision Makers Through Data Storytelling"

"How to Use Storytelling to Sell Your Data Science Projects"

"How to Get More Value From Data Visualization"

"Information as a Second Language: Enabling Data Literacy for Digital Society"

Interenterprise MDM

Analysis By: Simon Walker

Definition: Interenterprise MDM is a technology-enabled discipline that supports the shared governance of common master data assets used across ecosystems, business networks, B2B

integration, interenterprise analytics and collaborative business process enablement. An example is the governed semantic consistency of product data used within multiple PLM suites across a consortium. This style of semantic reconciliation supports multienterprise-governed data sharing at an extreme scale.

Position and Adoption Speed Justification: Interenterprise data models are relatively new and often not used alone, but as part of a business solution (for example, managing inventory status levels as shared master data across a partner ecosystem to support the implementation of vendor-managed inventory). They sit at the heart of the more scalable multienterprise business offerings in the market today. Interenterprise data-model-based MDM will likely be adopted to support the scale that comes with managing the often extraordinarily large number of devices and volumes of data associated with the Internet of Things (IoT) and, now, ecosystems and digital business.

A complex technology and discipline, it appears to be stalled within the broader market, so we continue to hold its current position on the Hype Cycle. We anticipate an acceleration once end users start to demand the kind of extreme-scale, information-based B2B, cloud-to-cloud (or intercloud) integration, hybrid and network-to-network collaboration that can address the challenges of interenterprise data sharing.

It is quite possible that blockchain will become a general-purpose technology that acts as a catalyst for the development and deployment of these more specific purpose technologies. We anticipate that these requirements will stem principally from the focus on digital business and supporting partner ecosystems.

User Advice: Select interenterprise MDM solutions based on current market offerings that target specific business processes (such as vendor-managed inventory, claims adjudication and so on) or cross-industry solutions (e-invoicing). Some vendors will incorporate a multienterprise data model as part of this and thus be capable of supporting an interenterprise MDM program. These vendors are in the minority and the technology's maturity is quite low. Pending the availability of more mature offerings, you should use traditional MDM solutions and disciplines, because they can scale upward to a degree and leverage existing business process networks, hubs or other integration initiatives. At some point, more multienterprise business applications may emerge built on multienterprise data models and MDM. Should this occur, internal legacy MDM solutions, MDM capabilities within legacy applications, and legacy point-to-point integration tools could be retired.

Note that your need for enterprise-centric MDM is likely to decline as interenterprise MDM grows, but it will not go away entirely. This will depend on the location of the bulk of your business operation (whether it is on the grid or network, or behind your firewall). Vendors do not yet generally offer stand-alone interenterprise MDM capabilities; they are often driven by a focus on industry-specific business process needs, or sets of processes/integrations.

Business Impact: Achieving semantic consistency for data across organizational boundaries can be approached in a variety of ways — including point-to-point and ad hoc methods (which are greater in number, and take substantial effort to maintain) to advanced API management and iPaaS offerings (that make use of artificial intelligence and machine learning) to interenterprise MDM. The primary benefit of multienterprise MDM over other forms of integration/governance is scalability and

automation. Interenterprise MDM supports a much more efficient and effective manner of integration and governance of semantics across the network of enterprises collaborating in multienterprise business processes through a shared common key that sits at the root of the data model. This discipline and its supporting technology together are enablers for the more complex shared or collaborative business processes delivered with multienterprise applications. Without interenterprise data models and MDM, such applications do not scale well when built on top of traditional enterprise-centric data models since process integrity requires semantic integrity. The inconsistency in design typically doubles or triples the amount of data needed to ensure process consistency.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: E2open; EnterWorks; IBM; One Network; SAP

Recommended Reading:

“Blockchain Is Not Ready for Master Data Management”

“Eight Ways Ecosystems Supercharge Business Models”

“Research Library: Fundamentals for Data Integration Initiatives”

Data Hub Strategy

Analysis By: Andrew White; Ted Friedman

Definition: A data hub strategy layers data and analytics governance requirements upon information sharing demands to establish the technology decisions needed for data integration. Once these decisions have been taken, the strategy drives implementation of a data hub(s) that links the work of data and analytics governance and sharing through to deployment involving various types of integration technology, governance related tools, metadata and, possibly, data persistence capabilities — physical and virtual.

Position and Adoption Speed Justification: A data hub strategy is both a new and an old idea. This is not a technology, but an approach to more effectively determine where, when and for whom data needs to be mediated, shared and then linked and/or persisted. A data hub is a logical architecture which enables data sharing by connecting producers of data (applications, processes and teams) with consumers of data (other applications, process and teams). Endpoints interact with the data hub, provisioning data into it or receiving data from it, and the hub provides a point of mediation and governance, and visibility to how data is flowing across the enterprise.

The position on the Hype Cycle relates to those organizations that are new to the idea; for those who have been “doing this” all along without the name, the hype is really not relevant.

The hype related to “data hubs” is almost at fever pitch. This is due to three factors:

- The opportunity created from the general failure of modern data and analytics efforts to cope with the complexity that forms from complex landscapes of applications and systems.
- The misinformation created by vendors who sell capabilities referred to as “data hubs” or “hubs” that have little to do with this modern design pattern.
- The mess that represents the language IT uses inside a firm and across the entire industry that inhibits a meaningful conversation. In other words, what a hub really is, is not agreed or understood.

Though data hub is defined in this context simply a conceptual, logical or physical node in which mediation (i.e., governance policy reconciliation) is achieved through sharing, linking, storing and exchanging semantically consistent data, it remains very confusing to clients. It turns out that this is mostly due to vendors who use the term hub to mean warehouse. A data hub does not imply a central physical repository. A hub is like a transit station on a rail network; it is not a place where all passengers converge; a hub is a small component, part of the infrastructure; it is not an endpoint like a data warehouse or data lake. Once clients get this point, the idea makes a lot of sense. However, vendor messaging will continue to confuse many users.

User Advice: Data and analytics program leaders, including chief data officers (CDOs) and information architects, should:

- In your architectures and business plans, recognize all applications, data warehouses and data lakes as endpoints. The purpose of a data hub strategy is to focus on key points of the entire landscape wherein to focus your efforts at implementing data and analytics governance more effectively.
- Design a data hub strategy to understand data and analytics governance and sharing requirements, and to drive integration efforts.
- Start by using Gartner’s Adaptive Data and Analytics approach to align the governance approach to the use case then follow up with Gartner’s Value Pyramid to align data efforts to outcomes, and Gartner’s Three Rings of Information Governance to identify the data that is most frequently used or is most important with most business value.
- Iterate changes to your data hub landscape as business requirements for data and analytics governance, data sharing and data integration change; perhaps even specializing certain hubs on specific kinds of data being governed, shared and/or integrated.

There are many types of data hubs in practice. One common example is an MDM implementation, whereby master data is shared and governed through a hub. Others include application data management, customer data platform (a form of ADM), logical data warehouse, and so on. This helps explain the low penetration: an explicit data hub strategy is very new and not well-penetrated even though numerous hubs themselves have likely been adopted for discrete, even siloed purposes.

Business Impact: In coordinating programs and projects, and “connecting the dots” with a hub strategy, the business benefits will tend to grow over time as more hubs are adopted. This is because, without a hub strategy, complexity and cost of data sharing grows exponentially — with the hub, it grows linearly. Organizations should focus on the most high-value or complex areas first in order to gain a significant business benefit impact through the deployment of the initial hub. A formal set of hubs, managing the trusted flow of data across the entire landscape of applications and warehouses and lakes, will also expose more trusted lineage information.

If you do not have any effective information governance, data sharing or effective integration programs in place, the benefits of starting with a data hub strategy (as opposed to trying to retrospectively fit one into an established environment) will be greater.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Recommended Reading:

“Use a Data Hub Strategy to Meet Your Data and Analytics Governance and Sharing Requirements”

“Implementing the Data Hub: Architecture and Technology Choices”

Multivector MDM Solutions

Analysis By: Simon Walker

Definition: Multivector master data management (MDM) solutions provide a fully integrated set of facilities for ensuring the uniformity, accuracy, stewardship, governance, semantic consistency and accountability of an enterprise’s official shared master data assets. They meet the needs of the business across all vectors of MDM complexity, including industries, data domains, use cases, organizational structures and implementation styles.

Position and Adoption Speed Justification: Multivector MDM solutions provide fully integrated support for all five vectors of MDM complexity: industry, data domain, use case, organizational structure and implementation style, as well as packaged capabilities to move between them. They contain comprehensive facilities for data modeling, quality, stewardship, data governance, and integration in workflow and transactional usage scenarios. They provide high levels of scalability, availability, manageability and security.

Comprehensive, integrated multivector MDM solutions are still new and very immature. Most offerings in the market today are really only multidomain MDM solutions at best, with some limited capability to support some aspects of the other vectors. Alternatively, vendors offer multiple MDM offerings in an attempt to meet as many multivector needs as possible. As such a true, complete multivector solution does not really exist yet, it remains mostly aspirational.

We have moved the position of multivector MDM slightly forward for this year, because the hype has intensified to the point that it is now a formal use case in our MDM Magic Quadrant and Critical Capabilities research. (However, often the hype still does not coalesce around the specific term “multivector.”) The market penetration has also increased slightly. This inertia conveys an accurate assessment of the challenges in achieving this capability, the current state of progress and level of innovation, and the time required for vendors’ capabilities to mature.

User Advice: Comprehensive multivector MDM solutions are still at the emerging stage, as first-generation (single-domain) and second-generation (multidomain) MDM offerings continue to mature and evolve. Conceptually, multivector MDM solutions should satisfy the overall needs of your MDM vision in a fully integrated manner, once they become widely available. In practical terms, however, your short-term and midterm MDM needs will only be met by integrating a combination of first- and second-generation MDM solutions on the market.

Create an MDM vision and strategy that aligns with and enables your organization’s business vision and strategy. Ensure that the vision meets your organization’s long-term MDM needs, in terms of including all necessary industry-specific requirements, data domains, use cases, organizational structures and implementation styles, as your implementation matures over time.

Perform a gap analysis between your long-term MDM requirements and the capabilities and roadmap of MDM vendors that provide a good fit for your MDM requirements. Balance criteria — such as long-term viability and fit with broader information management and application strategies — against MDM capabilities. If you are comfortable with the implications, invest on the basis that your chosen multivector MDM solution vendor will improve the consistency, breadth and depth of its offerings over time.

If necessary, invest in additional MDM products and vendors on a tactical basis. It is a good working assumption that most large and/or complex enterprises will need two or more MDM solutions during the next three or four years to address robust, complex domain-centric requirements. This will persist until vendors achieve the level of maturity necessary to meet end-user requirements with one integrated solution.

Business Impact: The successful implementation of a comprehensive multivector MDM solution in large, complex organizations with fragmented and inconsistent master data will potentially create a transformational business impact. This is because it will provide for sufficient organizational and technical functionality, and flexibility to fully onboard and optimize an enterprise’s master data assets.

As with single-domain and multidomain MDM implementations, the benefits realized will generally be in terms of improved growth in revenue and profits, cost optimization and efficiency — as well as risk management and regulatory compliance. However, it is quite likely that the benefits will increase significantly over time as organizations migrate from first- and second-generation MDM offerings to multivector MDM solutions.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Ataccama; IBM; Informatica; SAP; TIBCO Software

Recommended Reading:

“Use the 7 Building Blocks of MDM to Achieve Success in the Digital Age”

“Magic Quadrant for Master Data Management Solutions”

“Critical Capabilities for Master Data Management Solutions”

360-Degree View

Analysis By: Simon Walker; Bill O’Kane

Definition: A 360-degree view brings together selected data about a customer, product or other business-critical object to fulfill one or more specific business requirements. The resultant object can then be “viewed” holistically through many business contexts, whether they be operational or analytical. From these holistic views, better business outcomes can be achieved, such as improved customer or citizen experience, customer or citizen service, and procurement and product sales and service.

Position and Adoption Speed Justification: The 2018 Gartner CEO and Senior Business Executive Survey highlighted the continuing drive toward digital business, with 82% having a management initiative or transformation program to make the business more digital, up from 62% in 2018. As a result, CIOs, CDOs, and data and analytics leaders are seeking initiatives that exploit data as an asset, for the purpose of generating customer value and winning revenue (see “2019 CEO Survey: The Year of Challenged Growth”).

Gartner client inquiries through 2018 show that a growing number of companies are looking to expand the focus of their master data management (MDM) program to other types and forms of information to realize the 360-degree views. This is effectively expanding these MDM programs to an enterprise information management (EIM) scope. By 2020, 75% of organizations that use EIM to align, link and leverage their data and analytics investments will report substantially improved business or mission outcomes.

User Advice: A 360-degree view can only be achieved with a foundation of trusted master data at its core. Organizations that have delayed starting MDM programs will find that they now need a stronger business justification to move forward. They can leverage a framework such as Gartner’s Seven Building Blocks of MDM to accelerate this (see “Use the 7 Building Blocks of MDM to Achieve Success in the Digital Age”). However, MDM is only part of the story. Realization of a 360-degree view will require a combination of targeted master data, application data, and event or other relationship data to fulfill specific business requirements. Examples include a customer data hub or platform (see “Master Data Management Forms the Basis of a Trusted 360-Degree View of the Customer”), or a logical data warehouse.

Gartner client inquiries' through 2017 show that a growing number of companies are looking to expand the focus of their MDM program to other types and forms of information to realize their required 360-degree views. This is effectively expanding these MDM programs to application data management and even an enterprise information management (EIM) scope.

Business Impact: Organizations that neglect MDM, ADM and EIM while creating a 360-degree view risk delivering erroneous data to the business, from which poor operations, insights and decisions will result. However, master data on its own is not enough. Data and analytics leaders that successfully identify and connect additional data sources to trusted master data in support of specific demand-centric business requirements will unlock the potential for business value. As such, a 360-degree view can be used to “close the loop” so that operations, insights and decisions based on business-critical objects can then be made holistically through many business contexts.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Adobe; IBM; Informatica; MapR Technologies; MarkLogic; Microsoft Azure; Reltio; Salesforce; Semarchy

Recommended Reading:

“Master Data Management Forms the Basis of a Trusted 360-Degree View of the Customer”

“Create Powerful Customer Experiences With a 360-Degree View of Your Products”

“MDM Is Critical to Maximizing CRM and Customer Experience”

“Market Guide for Data Virtualization”

“Use a Data Hub Strategy to Meet Your Data and Analytics Governance and Sharing Requirements”

“Implementing the Data Hub: Architecture and Technology Choices”

Cloud MDM Hub Services

Analysis By: Sally Parker; Simon Walker

Definition: MDM hubs are the physical result of a master data management (MDM) implementation and can take the form of multiple implementation styles. Cloud MDM hub services are cloud-based master data services available across a spectrum of resource delivery models, ranging from single-tenant share-nothing (IaaS) to multitenant share-something (PaaS) to multitenant share-everything (SaaS).

Position and Adoption Speed Justification: Gartner sees sustained but low interest in cloud MDM hub services among end-user organizations. This interest appears to be driven by three broad themes:

- Broader interest in cloud-based technology
- Opportunity to shift from a capex to opex funding model for MDM-enabling technology
- Increased availability of cloud-based MDM solutions

Though on the rise, interest in cloud MDM remains low among Gartner clients, which are typically large enterprises. In 2018, less than 4% of MDM-related inquiries to Gartner mentioned cloud. Of those that did, lower-cost software licensing and MDM solutions for cloud CRM were common themes.

Privacy issues (including GDPR) have played a role in dampening adoption of cloud-based data hubs for MDM. While security and privacy concerns for other data types have eased with ongoing adoption of cloud-based technologies, master data is often deemed critical to organizations, so less of it has migrated to the cloud by comparison. However, vendors of packaged MDM software solutions continue to migrate their technology, delivery models and licensing models toward the cloud at pace, driving an inevitable market shift over time.

User Advice: As cloud MDM hub services mature, consider implementing them if you lack in-house MDM technical skills — especially if you are naturally an early adopter. These services may also be an attractive option if an opex funding model is desirable, and if the planned MDM capability is limited in scope to mainly one functional group (e.g., sales for sales data, or supply chain for supply chain-related data) within your organization.

You may be implementing an enterprisewide operational MDM capability that requires tight, real-time and/or transactional integration with existing and new business applications, or that requires complex workflow and application interaction patterns for master data. In these cases, deploy the MDM solution on-premises or in a private cloud behind a firewall in the short term, because such solutions will not necessarily be cheaper in the cloud due to the complexity of these requirements.

Organizations with complex requirements or extended implementation roadmaps should not assume that a move to cloud MDM hub services will significantly lower their TCO or reduce complexity. However, organizations with tight capital budgets, those that have constrained IT resources or those that want to deploy something simple quickly should consider these services, as long as they mitigate their risks with appropriate governance controls.

MDM vendors are increasingly offering cloud-based solutions, following in the footsteps of other software vendors in streamlining their delivery and transitioning to annuity revenue models. Organizations looking at longer-term MDM strategies should select a vendor whose cloud strategy aligns with their preferences — but be mindful that, at some point, on-premises feature upgrades are likely to lag those of their cloud-based equivalents.

Business Impact: Cloud-based MDM hub services potentially offer organizations access to new funding models, deployment flexibility and improved time to value. These services could also help companies that lack the MDM knowledge, experience and resources to deploy and maintain on-

premises MDM software. However, these cloud services may prove more expensive on a TCO basis because the operating expense does not decrease over time.

Furthermore, regardless of service type or capability, adoption of cloud-based technologies often leads to greater fragmentation within an enterprise's application portfolio across a hybrid infrastructure model. Business processes will need to be optimized across the multiple platforms. And because master data is heavily shared, there will often be a need for complex integration into the MDM system, its data sources and supported processes. Of equal importance and complexity will be the information governance required within the resultant hybrid system, application and data infrastructure.

Prospective benefits are in line with those of other cloud services. They include rapid prototyping and development, reduced infrastructure costs, and the fact that the cloud-based MDM service provider assumes responsibility for the often complex and risky MDM software upgrades.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Ataccama; Informatica; Oracle; Orchestra Networks; Profisee; Reltio; Riversand; SAP; Semarchy; Stibo Systems

Recommended Reading:

"Magic Quadrant for Master Data Management Solutions"

"Critical Capabilities for Master Data Management Solutions"

"Assess the Impact of MDM Vendors' Machine-Learning, GDPR and Cloud Solutions"

"Beyond the Gathering Storm: Governing Data and Analytics in the Cloud"

Digital Ethics

Analysis By: Jim Hare; Frank Buytendijk; Lydia Clougherty Jones

Definition: Digital ethics comprises the systems of values and moral principles for the conduct of electronic interactions, and the use and sharing of data between people, businesses, governments and things.

Position and Adoption Speed Justification: Digital ethics jumped several positions toward the Peak of Inflated Expectations due to the recent wake of well-publicized negative press, rising public discourse, and new regulatory compliance including data privacy considerations. Current themes such as "artificial intelligence," "fake news," and "digital society" are triggers driving the increased need for digital ethics. Innovations such as the Internet of Things, 3D printing, cloud, mobile, social and AI are moving faster than business, governments and society can organize around it or even

comprehend. Government commissions and industry consortiums are actively developing guidelines for ethical use of AI (see [“Ethics Guidelines for Trustworthy AI”](#)).

The probability that unintended consequences will occur is high as the use of technology creates distance between morals and actions. For business and the technologies used in business, a morally agnostic stance is a position that simply cannot and should not be sustained. Digital ethics require societal, economic, political and strategic debate, new types of governance, and new processes and technologies to control new technologies.

User Advice: Privacy rules and data protection provide a legal minimum in handling data that is insufficient. Instead, take a “care ethics” approach to the application of digital technologies in the business world to reconcile principles and consequences. The core question of care ethics is, “How do we take responsibility for the consequences of our actions, even if they are unintended?” (see [“Data Ethics Enables Business Value”](#)). In the digital world, the concept of care ethics is not only about people, but also about how businesses and even technologies act. Care ethics teaches that ethics is about taking responsibility when confronted with situations you feel are not OK. Apply “care” ethics by following these call to actions:

- Be empathetic — put yourself in the other person’s shoes; develop a sense of right and wrong that goes past just being afraid of punishment or hoping to generate a product sale whether legally or in terms of customer loyalty.
- Take responsibility — taking responsibility is essential for taking the lead within your ecosystem, and being the interface to the customer or citizen. In emerging digital environments, taking responsibility over the use of digital technologies, even if legally not required, builds and improves trust.
- Display competence — build the capacity and expertise to be able to quickly and adequately address problems. Don’t simply acknowledge the need to care and accept the responsibility; you also need to be able to follow through.
- Promote trust — trust is needed to make the other three calls to action work. It is great to take responsibility, but if your stakeholders do not trust you to do so, your offer will not be accepted.

Business Impact: Digital ethics should be treated as a tangible business practices discipline rather than an academic discussion. Key areas where it should be applied include social and mobile technologies, and social interaction; cloud and security; big data and privacy; autonomous technologies and freedom; artificial intelligence/robotization and the value of work; and predictive algorithms and decision-making.

The four areas of business impact, listed in increasing order of “moral development” are:

- **Submitting to compliance** — staying within the boundaries of the law.
- **Mitigating risk** — being mindful of not using technology in ways that can upset stakeholders, or cause reputational or financial risk in other ways.

- **Making a difference** — making ethical use of data and technology as a proposition that sets you apart in the market. For example, this could be in terms of data for good initiatives or social purpose.
- **Follow your values** — there is a direct correlation between the use of technology and delivering value to customers, other stakeholders and yourself.

Actively engage and participate in online data ethics and data for good initiatives such as Data for Good (see “How to Use Data for Good to Impact Society”).

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Recommended Reading:

“Top 10 Strategic Technology Trends for 2019: Digital Ethics and Privacy”

“Digital Ethics, or How to Not Mess Up With Technology, 2017”

“How to Use Data for Good to Impact Society”

“The CIO’s Guide to Digital Ethics: Leading Your Enterprise in a Digital Society”

“How to Apply Gartner’s Digital Humanism Manifesto”

“Data Ethics Enables Business Value”

“Modernize Data Privacy to Put the Personal Back Into Personalization”

“Workplace Analytics Needs Digital Ethics”

“The #DigitalSociety Requires a Digital Social Contract”

Digital Twin

Analysis By: Alfonso Velosa; Benoit Lheureux; Marc Halpern

Definition: A digital twin is a virtual representation of an entity such as an asset, person or process and is developed to support new or enhanced business objectives. The three types of digital twins are discrete, composite and organizational. Required elements to meet business objectives are model, data, a one-to-one association, and monitorability, optional elements are analytics, control and simulation.

Position and Adoption Speed Justification: The idea of modeling things, people, and processes continues to gain traction.

- For operators (aircraft, buildings, power plants), digital twins are starting to gain adoption. Their primary near-term use includes lowering maintenance costs, increasing asset uptime/reliability, and employee safety.
- For product OEMs, digital twins are beginning to proliferate (cars, hot tubs, stereos). The near-term drivers for digital twin adoption are differentiation, understand customers, help manage warranty costs, sell consumables, and support channel partners.
- For processes, digital twins are being developed to model IT organizations, financial exchanges, business processes such as purchase orders.

The digital twin profile is at the Peak of Inflated Expectations, even though this is very early in its evolution, based on excess levels of marketing by technology and service providers. Part of the reason it is moving along so fast, is the fact that most enterprises implementing IoT projects are probably also implementing digital twins. Although 6% of enterprises have started implementing digital twins, less than 1% of assets have digital twins (see “Survey Analysis: Digital Twins Are Poised for Proliferation”). In the next decade, digital twins will become the dominant design pattern for digital solutions.

User Advice: CIOs should identify and prioritize opportunities to use digital twins for business outcomes. To do this, consider the following:

- **Business outcomes:** Determine with business leaders the outcomes (financial, innovation, productivity) they hope to realize by exploiting digital twins. This must align with a clear business driver to justify the costs, benefits and risks of digital twins. Use this guidance and the digital transformation strategy to establish an IT vision for digital twins.
- **Technology:** Start with models of entities such as an asset, people or processes based on key business uses, whether it is of a fleet of trucks or of the foreign exchange trading desk. Determine what data is necessary to “feed” the models and the types of analytics needed. Use standards where possible, but don’t let their dearth limit innovation. Assess how composite and organizational digital twins (see “What to Expect When You’re Expecting Digital Twins”) will require integration and custom development.
- **Stakeholder engagement:** Engage the business unit to identify champions and experts build their digital twin strategy, requirements and roadmap. This may require discussions on the nature of digital twins, their value, and issues such as paying for software asset life cycle management.
- **Digital ownership and ethics:** Work with business and legal teams to establish a policy on ownership of the digital twin models and data, as well as who may participate. Ensure this digital ethics policy helps engage ecosystem stakeholders about what data may be shared and monetized.
- **Risk analysis:** Create a threat and opportunity analysis of the current business ecosystem, incorporating digital twin development by competitors or partners.
- **Vendors of digital twins:** CIOs should look for portfolios of digital twins from technology providers who align with their industry practices and needs.

Business Impact: Digital twins are transformational as they enable business to drive new digital business models as well as update existing models.

For example, they enable superior asset utilization, service optimization and improved customer experience. They create new ways to operate, such as consumption of physical outcomes instead of the capital expenditure acquisition of industrial assets, or new ways to drive an ecosystem or supply chains. And they will open new ways to monetize data.

Digital twins will challenge most enterprises to change their thinking of master data from an IT practice to one that engages the business units and IT to get a more comprehensive situational awareness of assets, people, or processes. In addition, a digital twin can be expensive to maintain, and represent a liability if it loses synchronization with the entity (and, for example, delivers a sedative instead of a stimulant).

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Accenture; ANSYS; GE Digital; IBM; MathWorks; Microsoft; OSIsoft; Particle; PTC; Siemens

Recommended Reading:

“What to Expect When You’re Expecting Digital Twins”

“Why and How to Design Digital Twins”

“Survey Analysis: Digital Twins Are Poised for Proliferation”

“CIOs Must Prepare for Cross-Industry Digital Twins”

“Demystifying the Digital Twin in Oil and Gas”

“Five Approaches for Integrating IoT Digital Twins”

“Predicts 2019: IoT Will Drive Profound Changes to Your Core Business Applications and IT Infrastructure”

Data Catalog

Analysis By: Guido De Simoni; Ehtisham Zaidi

Definition: A data catalog is a technology capability that is used to manage an inventory of heterogeneous and distributed data assets through the discovery, organization and description of the enterprise datasets. It provides context to help data analysts, data engineers, data scientists,

data stewards and other data consumers to locate a relevant dataset and understand what it means, in order to determine and extract business value from it.

Position and Adoption Speed Justification: While a data catalog continues to be viewed as a critical capability in broader data management and analytics solutions, point catalogs (that are offered as part of a broader data management, cloud or analytics solution) will be successful in accessing and inventorying metadata only within the context of these narrow or use case specific solutions. Just like the market ended up introducing data silos, there is a growing fear of introducing metadata silos due to these embedded data catalogs in broader solutions. The market is therefore looking for independent/stand-alone catalogs that are application neutral and more capable of cataloging data across the organizations data assets. Gartner also believes that there is still room for specialized data catalogs that are more mature in their usage of machine learning to automate parts of the data catalog implementation process. Therefore, while we do believe that many data and analytics offerings will increasingly include data cataloging as an included capability, within their specific tools, there appears to be an emerging case for stand-alone data catalogs. However best-of-breed, stand-alone catalogs will become less relevant over time since the real value is not in cataloging but in what you do with the results — as in the use case. In the longer term the data catalog will be an AI-automated feature. As technology capability is still valid to state that data catalog will be obsolete before plateau.

User Advice: The overall complexity and sophistication of the business data environment — along with the number of datasets, their volumes and distributed nature — are rapidly overwhelming human analysts; particularly with the increasing need to incorporate and correlate exogenous datasets in support of innovative use cases driven by digital business and the IoT.

- Data and analytics leaders should exploit this emerging category of tools or solutions that embed data catalogs as a capability or as a stand-alone offering and that are present in the market under a variety of different names.
- Evaluate each solution alongside your existing data investment because different vendors have subtly different approaches to addressing data catalogs and no one catalog will yet meet all your data and analytics needs.
- Your functionality requirements should be balanced with other aspects such as vendor execution and vision, service and support, requirements for information security, data and analytics governance and total cost of ownership.
- Proceed in the knowledge that tool-specific embedded data catalogs (such as those delivered as part of a Hadoop distribution, a cloud-based data lake or a data preparation tool) will improve data usability, trust and shareability only in the context of that particular tool.
- Data Catalogs are just that — catalogs. The knowledge gleaned from cataloging information assets (of all kinds) can be used in many use cases, and each use case will have other technology-enabled requirements that need to be evaluated independent of the catalog itself. As such, vendors offering “catalog” capability are not all “catalog” vendor per se, some might be focused on analytics development, some on data and analytics governance. Be aware and evaluate like vendors accordingly.

- Finally, give due preference to business focused catalogs that appeal to the business teams and use embedded machine learning capabilities to rapidly simplify and (in some cases) even automate the data catalog process.

Business Impact: Data catalogs will:

- Contribute to the ability to achieve insight from critical business data that is currently difficult to integrate and analyze due to the inability of organizations to inventory and curate their distributed, heterogeneous data assets.
- Support evolving nonrelational data initiatives (including data lake initiatives) by highlighting the data that is available.
- Enhance the organization's ability to share and curate the data at its disposal across teams, functions, environments and processes.
- Coordinate and enhance data and analytics governance processes as a business-enabling capability.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Alation; Attivio; Collibra; Informatica; Unifi; Waterline Data

Recommended Reading:

"Data Catalogs Are the New Black in Data Management and Analytics"

"Applied Infonomics: Use a Modern Data Catalog to Measure, Manage and Monetize Information Supply Chains"

"Market Guide for Data Preparation"

"Magic Quadrant for Metadata Management Solutions"

"Magic Quadrant for Insight Engines"

Data Classification

Analysis By: Marc-Antoine Meunier; Alan Dayley

Definition: Data classification is the process of organizing information assets using an agreed-on categorization, taxonomy or ontology, thus enabling effective and efficient prioritization for a data and analytics governance policy that spans value, security, access, usage, privacy, storage, ethics, quality and retention. It involves applying contextualizing metadata to facilitate the use and governance of the data and analytics.

Position and Adoption Speed Justification: There are many reasons to classify data, and who/what system establishes and enforces classification differs by use case and implementation. Data classification continues to gain momentum this year, due mainly to digital business transformation (with catalogs needed to mine new, innovative business moments and decisions), the emergence of more-automated and machine-learning-driven approaches, and increased regulatory pressures and opportunities spanning privacy. Privacy regulations, led by the General Data Protection Regulation (GDPR), have blended opportunities to classify data around individuals and entities, with security-centric classification efforts, and added impetus for data life cycle management. The continued migration to the public cloud is motivating organizations to classify their data ahead or as part of that migration, and platform vendors (e.g., Microsoft) have responded by providing improved support for data classification and tagging.

Data risk and value assessments rely heavily on data classification. For example, security teams use classification technology to assign risk profiles to data. Likewise, the emergent field of infonomics requires classification capabilities to assign value and liability to varying datasets.

The tools available to treat classification holistically and examples of organizations operating under those guises are starting to emerge; however, the position in the Hype Cycle reflects a majority of partial or siloed adoption.

User Advice: Data classification can be associated with attempting the impossible — to identify, tag and store all of an organization's data, without first taking into account the utility, value and risk of that data. Instead, organizations should assess information assets for value and risk to isolate the data that has minimal or no value to the organization (which may leverage the Pareto principle of 80/20 of all data stored), and address any archival, retirement, destruction, risk and security requirements. Use an ongoing and iterative approach, instead of sparse audits, although an initial discovery of data assets through a scan may help to kick-start the process and help with cross-organizational engagement. The key is to start somewhere that will have a business impact and build out the information catalog over time.

Data classification must be an ongoing aspect of changing organizational behavior within the data-driven culture, and be supported by data and analytics governance and metadata management. The office of the chief data officer (CDO) and the chief information security officer (CISO) should collaborate on and leverage the data classification efforts. Additional roles that may be involved include the data protection officer (DPO), compliance, legal and records.

Data classification recommendations include:

- Implement data classification as part of a funded data and analytics governance program.
- Determine organizationwide classification use cases and efforts, and, at a minimum, keep all interested parties informed.
- Combine privacy regulation adherence efforts with the security classification initiatives overseen by the CISO.

Business Impact: Targeted classification, combined with the capabilities of information stewardship tools, will enable organizations to produce faster, more reliable and efficient data use for discovery,

risk reduction, value assessment and analytics. This enables organizations to focus security and analytics efforts primarily on their important datasets. Identity-centric classification efforts can assist when managing concerns for the GDPR, the California Consumer Privacy Act (CCPA) and other privacy regulations.

Classification enables CDOs to drive information asset management as a value-adding opportunity to support better business outcomes, rather than being an approach driven by compliance and records-keeping requirements.

Data classification can be used to support a wide range of use cases:

- Data privacy
- Risk mitigation
- Master data and application data management
- Information stewardship
- Content and records management
- Data catalogs for business intelligence (BI) and analytics
- Data discovery for analytics and application integration
- Efficiency and optimization of systems, including tools for individual

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: ASG Technologies; Collibra; Dathena; IBM; Informatica; Microsoft; OpenText; Symantec; TITUS; Waterline Data

Recommended Reading:

“Effective Information Governance Needs SMART Principles”

“Best Practices for Data Retention and Policy Creation Will Lower Costs and Reduce Risks”

“Toolkit: How to Classify Information Assets to Be Governed in Applications”

“Applied Infonomics: Use a Modern Data Catalog to Measure, Manage and Monetize Information Supply Chains”

“Improving Data Security Governance Using Classification Tools”

Enterprise Metadata Management

Analysis By: Guido De Simoni

Definition: Enterprise metadata management (EMM) is a business discipline for governing shared metadata assets between and across disparate data, and between and across analytics projects and programs, such as those for master data management (MDM), business intelligence (BI) and records management. The aim is to achieve the benefits of enterprise information management (EIM).

Position and Adoption Speed Justification: Most organizations cope with managing metadata *in situ* — that is, within the confines and needs of each data and analytics program, business initiative or system (for example, an MDM program, a BI initiative and a data warehouse implementation will include a specific metadata management focus). But EMM — the discipline of aligning and governing shared and common metadata between all such programs — is much harder to develop, as the business case for it is harder to formulate and communicate. Hype remains significant due to technological innovations, like modern data catalogs, that are sparking new interest in linking information silos to improve the value of information-based business outcomes. These innovations increase the need to govern information assets across multiple information management investments, which in turn creates fresh demand for EMM and EMM-enabled systems. At the same time, when EMM is poorly planned it can be prohibitively costly to implement technologies capable of managing the enterprisewide variety, volume, velocity and complexity of metadata about vital information assets. Modern metadata management tools are now able to offer functional capabilities, automation through machine learning and data valuation methods that push new EMM adoption. EMM is therefore moving off the Peak of Inflated Expectations, but for most organizations adoption remains at an early phase. At the same time, various technology innovations, while trying to fill EMM gaps, are disrupting the discipline's maturation, which means EMM will move more slowly along the Hype Cycle.

User Advice: Defining EMM needs is a key responsibility of the chief data officer or data-savvy business leaders, whereas the implementation and ongoing management typically falls within the realm of the CIO. This mishmash of responsibilities requires dedicated executive oversight and ongoing discipline for organizations to derive sustainable business value from EMM. Explore EMM when you have common corporate goals, yet disparate information management programs (each with its own metadata) that are neither aligned nor sharing consistent information. Use EMM to help govern the metadata and information assets between these programs.

EMM is valuable when your organization needs to incorporate its information management programs into a more mature EIM framework. Examples are when you need to manage enterprise metadata in support of analytics programs and when you heavily leverage metadata for many different operational systems. Since EMM is key to the efficient and effective reuse of analytics across an organization, data and analytics leaders must expand metadata initiatives beyond traditional information governance to drive analytics consistency and operational efficiency. If your goal is to align information across these metadata elements, grow the “connections” between the programs and datasets as needed, over time, and use EMM to govern the shared metadata.

For many, the best way to start is to identify and publish which key information assets and metadata are currently managed by which primary stakeholders and shared with others. In addition, a trusted inventory of key data assets will assist the effort. You need an EMM strategy or plan for how to improve the situation by drawing on other planned initiatives, which may involve the participation of individuals from different organizational units.

Business Impact: EMM helps extend the benefits of other programs — such as those for analytics, MDM, data quality, data integration, business process management and service-oriented architecture — by supporting reconciled semantics in the information sources they use. Metadata management should occur within those programs individually, but EMM is needed to achieve synergies across them by reconciling the semantics and governing the resulting enterprise metadata and model. Equally, when managing and governing data assets within the context of a pace-layered strategy, EMM is needed to align the semantics across the layers.

To create and sustain an EMM program, you need to account for people and process issues, as well as technological issues and choices. These issues include those related to identifying the best metadata to use, the viability of the technology housing the metadata, and the most suitable approaches to federating or consolidating metadata across technologies.

Many service providers offer training and consulting in EMM. In addition, metadata management solution vendors provide training and consulting in a more coordinated and customized way to support specific EMM use cases.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Recommended Reading:

“Key Recommendations for Implementing Enterprise Metadata Management Across the Organization”

“Use Enterprise Metadata Management to Extend Information Governance to Analytics”

“Applied Infonomics: Use a Modern Data Catalog to Measure, Manage and Monetize Information Supply Chains”

Analytics Governance

Analysis By: Guido De Simoni

Definition: Analytics governance is the process of assigning and ensuring organizational accountability, decision rights, risks, policies and investment decisions for business analytics, calculation rules, predictive models and algorithms. It is a component of overall data and analytics governance and is enabled with a common set of capabilities.

Position and Adoption Speed Justification: Many organizations realize the need to govern not only data, but also the analytics applied to data — particularly with the increasingly decentralization of analytics use cases. Analytics governance is often actually a conscious decision to govern analytics separately from data governance. However, Gartner interactions with clients reveal that enterprise-level governance practices and policies are still in their infancy in most organizations. Analytics are an integral part of any business strategy, but come with the risk of incorrect, insufficient, illegitimate or unethical application. Business analytics are applied throughout organizations and their ecosystems: They can introduce a heterogeneous, often siloed, landscape of analytic approaches. Business units and departments are increasingly implementing their own analytics tools and applications. The questions “Could it be analyzed?” and “Should it be analyzed?” must become integral parts of an organization’s governance model, for instance, to avoid severe damage to its reputation. Analytics governance needs to ensure the viability, relevance, transparency, reproducibility, legitimacy and appropriateness of the analytics applied. Data governance and analytics governance, therefore, work in tandem and need to be effectively integrated. A conversation about this convergence is underway, but convergence is still maturing in most organizations. As organizations recognize the need to break down silos and consider the ecosystem of data and analytics governance, we expect the hype about analytics governance to lessen. We therefore also expect that analytics governance will be obsolete before it reaches the Plateau of Productivity.

User Advice: Any analytic, predictive or decision-making process is based on data models, which should be developed in accordance with data governance policies for data integrity, fidelity, quality, security, privacy and retention. Furthermore, the information assets used for analytics constitute a significant portion of the overall expense of applying business analytics.

This leads to the strategic need for a consistent application of analytics governance across the organization.

Specific recommendations:

- Extend your data governance by the inclusion of analytics governance. Don’t attempt to institute analytics governance as a stand-alone initiative.
- Develop trust models for both the input data used for analysis and the resulting analytics outcomes.
- Ensure the transparency and proprietary of analytics. Analytics are required in many regulated industries, but, beyond this, users might distrust “black box” analytics.
- Implement a change management approach to help your organization become fact-driven, ensure traceability and reproducibility of analysis, and, most importantly, help your organization become fact-driven.
- Don’t assume your analytics, business intelligence, data science or artificial intelligence solutions support your requirements for analytics governance — most do not. At best, such solutions might respect one policy, such as user access. You will need to take it upon yourself to define requirements and evaluate solutions — and most likely add solutions designed to meet those requirements.

Chief data officers and other data and analytics leaders should ensure that analytics governance and data governance are integrated, and do not become isolated practices in different parts of the organization.

Business Impact: Analytics governance should be established in accordance with corporate and data governance policies with respect to:

- Balancing and prioritizing investment decisions for business analytics in accordance with business strategy and goals.
- Defining processes and policies on the delegation of authority and accountability for analytics decision rights.
- Ensuring legitimate and ethical use of analytic algorithms, in line with corporate values.

Failures of analytics governance can be operationally costly and high-risk. Consequences may include an inability to implement analytics due to users' resistance ("That's how we do business here!"), dissatisfaction and misinterpretation of insights. Investments in solutions to help with the task of setting and enforcing analytics governance policy may lead to additional investments beyond those you have for data governance. Over time, though, we expect capabilities to converge, so your investments will, in time, also converge.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Collibra; Waterline Data

Recommended Reading:

"Use Adaptive Governance for Data and Analytics to Drive Digital Business Success"

"Use Enterprise Metadata Management to Extend Information Governance to Analytics"

Sliding Into the Trough

Data and Analytics Governance

Analysis By: Andrew White; Debra Logan; Alan Dayley

Definition: Gartner defines data and analytics governance as the specification of decision rights and an accountability framework to ensure appropriate behavior in the valuation, creation, storage, access, analysis, consumption, retention and disposal of all information assets. Data and analytics governance includes the principles, guidelines, standards, policies, procedures and links to outcomes and metrics that ensure the effective and appropriate use of data and analytics in enabling an organization to achieve its goals.

Position and Adoption Speed Justification: In the last year the areas of growing hype and interest include AI model governance, analytics governance in data warehouses/lakes, IoT data governance, ethics as a discrete policy, and continued interest in bringing together multiple policy disciplines for unified governance spanning quality, privacy, security and others. The scope, however, remains all data: application data, content, records, external social data, master data, metadata, algorithms and AI models, analytic models, and KPIs or metrics.

Data and analytics governance is as much an umbrella term for what is essentially for many organizations massively siloed and fragmented work across many different teams, spanning business (sales, marketing, customer support), administration (operations, finance, risk etc.) as well as IT (security, privacy, quality) etc. In truth, the hype related to data and analytics governance waxes and wanes by industry, region and size of company as well as policy. For example, privacy has been the hottest and most hyped in the last couple of years. Last year it was driven by GDPR in Europe, and this year, it has been concerning California Consumer Privacy Act (CCPA) in the U.S. with a careful watch on the U.S. Congress and a possible national privacy act. As such, this dialogue (as part of the Hype Cycle) is more of an amalgam rather than a discrete, single dialogue applicable to every organization everywhere.

User Advice: Data and analytics governance is complex, organizationally challenging and politically sensitive. It is often difficult to get executive-level consensus for governance programs, since too many organizations equate the work with compliance; and too few initiatives are outcome driven. The desired outcome for governance is to lead to changes in business behavior so that data and analytics enables better decision making and improved business outcomes.

You should seek to governing the least amount of information, with the least amount of effort that has the maximum business impact, coupled with a need to mitigate risk associated with unmanaged data. The complexity and difficulty of data and analytics governance can be addressed by adopting the concept of adaptive data and analytics governance to allow organizations to focus robust governance on only the most strategic information they hold. More organic, or “bottom up,” data and analytics governance takes place in more dynamic environments.

There is, as yet, no single solution for data and analytics governance for all policies; only an evolving set of solutions spanning a wide array of capabilities spanning metadata management through to some solutions that have focused on the work related to policy interpretation and enforcement that have a business user orientation (see “Market Guide for Information Stewardship Applications”).

To succeed, follow these steps:

- To get started, focus on the work of data and analytics governance by orienting around agreed and prioritized business outcome (with a business case) or objectives.
- Identify key stakeholders to collaboratively co-sponsor the initiative, including or focusing on the CDO.
- Focus on the “least amount of data that has the maximum impact on business outcomes” as that will help embed the work of D&A governance into a business context, by the business, for the business.

- Explicitly define the work related to D&A Governance: Policy evaluation and setting, policy interpretation and enforcement, and policy execution. The first two need to be led by business and the latter can be managed by IT.
- Link data and analytics governance to corporate governance and enterprise digital governance initiatives.
- Lastly, and only when they are emergent, focus on data standards and metadata. These aspects of D&A governance are necessary but not sufficient, and most often not even important to business leaders.

Business Impact: Well thought out and effective data and analytics governance improves the integrity of the business process, business application, report or decision the user is seeking to enact. D&A governance can extend across all aspects of information, including:

- Abstractions — Such as metadata, analytics and algorithms
- Formats — Structured versus unstructured information
- Functions — For example, authorship, access and discovery
- Life cycles — Inception, storage, persistence, analysis, archival, disposal
- Media — Paper versus electronic
- Usage — Such as transactional/operational and analysis
- Domains — Financial data and customer data
- Types — Application data, transaction data, analytical data, files, documents, images, digital, analytical data, master data, metadata, etc.

Ensure that you have identified a concrete business outcome (such as a reduction in medical claims rejected by payers due to incorrect information). Then, measure that outcome, taking into consideration relevant leading indicators as appropriate, using a balance scorecard such as “The Gartner Business Value Model: A Framework for Measuring Business Performance” and “Use Gartner’s Value Pyramid to Connect Data and Analytics to Business Value”

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Recommended Reading:

“Reset Your Information Governance Approach by Moving From Truth to Trust”

“Use Gartner’s Value Pyramid to Connect Data and Analytics to Business Value”

“Toolkit: Keep Your Data and Analytics Governance Initiative Relevant to the Business”

“Ten Steps to Information Governance”

Information Stewardship Applications

Analysis By: Guido De Simoni; Andrew White

Definition: Information stewardship applications are solutions that support the work of information stewards. Application capabilities may include monitoring of data governance policy performance, such as data quality, access to data models, a business glossary (integrated with a data dictionary), tasks, workflow, exception management, business rules and policies, audit trails and lineage, and analytics. Additionally, these applications may include playbooks, preloaded templates and other capabilities to help make this business role more effective.

Position and Adoption Speed Justification: Currently, information stewardship applications leverage the capabilities of more technology-oriented solutions that are already on the market. However, they are packaged to meet the requirements of information stewards who support the work of information policy enforcement as part of their normal, business-centric, day-to-day work in a range of use cases. Information stewardship applications are in the Trough of Disillusionment and maturing very slowly. They are supporting the evolution of, and lessons learned from, the information stewardship discipline, but they have been disrupted as a stand-alone market by a number of new drivers relating to the demand for data and analytics governance operationalization. The complexity that is emerging — associated with, for example, increased interest in data lakes and Internet of Things analytics — extends the need for policy enforcement in analytical use cases. The overlap between the data governance board and the analytics center of excellence, which is now discovering that it needs to comply with and respect policy set by others, has not been captured in the market. Finally, it is fast becoming clear that, as stewardship gets established, such programs are in fact initiatives focused on business process integrity and outcome improvement, and much less about data for data's sake or data at a point in time. Instead, they relate to ongoing data governance for specific use cases. This variety of requirements affects vendors' experimentation with and assessment of information stewardship applications. In particular, we observe clear market disruptions related to the adoption of data catalogs and organizations scrambling to work within the privacy management requirements of regulations such as the EU's General Data Protection Regulation (GDPR).

User Advice: Data and analytics leaders should work with their technology providers to help them understand what data and analytics governance work can be made operational with appropriate technology. If you need to steward data outside a data and analytics governance program, tread more carefully, because the lack of unifying drivers for master data management (MDM), records management or enterprise content management could result in few technology choices.

In particular, data and analytics leaders should:

- Evaluate the capabilities needed from fit-for-purpose, business-user-oriented information stewardship and other solutions, as compared with IT-centric data management tools, including data quality, metadata management and federation/integration capabilities.

- Run a proof of concept of vendor solutions involving all contributing roles, such as business users, information governance board members, information architects, information stewards and business analysts.
- Focus on all dimensions (people, process, technology and data) when addressing the information stewardship use case. These dimensions are relevant for effective use of a solution to maximize your ROI through reuse, while also minimizing administrative costs and errors due to inconsistencies across technologies.

Business Impact: Data and analytics governance is a core component of any enterprise information management (EIM) discipline. Such governance cannot be sustained and scaled without an operational information stewardship role and function. At worst, the lack of effective stewardship, and hence ineffective governance, will lead to the failure of EIM initiatives; at best, it will result in lower-than-desired benefits.

A successful stewardship routine will lead to sustainable and persistent benefits in support of programs and projects such as EIM, MDM, application data management, analytics and business intelligence. These benefits include increased revenue, lower IT and business costs, reduced cycle times (for new product introductions, for example), improved trust in organizational data, and increased business agility.

In particular, the impacts of information stewardship applications include:

- Encouragement to share data, increased data reuse, improved consistency and accelerated time to value because of the use of existing data dictionaries to identify areas of synergy between data used for different business initiatives (both data content and meaning).
- More effective understanding and communication of the semantic meaning of data. This will facilitate resolution of contention between business teams when inconsistency arises, and reduce the amount of time and effort wasted on reconciliation, so that efforts can focus on new business actions.
- Intelligent decisions about the information life cycle, from data interoperability and standards to archiving, disposal and deletion.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: BackOffice Associates; Collibra; Global IDs; Infogix; Informatica; Protago; SAP

Recommended Reading:

“Market Guide for Information Stewardship Applications”

“The Role of Technology in Data and Analytics Governance”

Metadata Management Solutions

Analysis By: Guido De Simoni

Definition: Metadata management solutions (MMSs) are software applications that include one or more of the following: metadata repositories, a business glossary, data lineage, impact analysis, rule management, semantic frameworks, and metadata ingestion and translation from different data sources. Metadata describes various facets of an information asset in support of four use cases: data governance, data risk and compliance, analytics and data value.

Position and Adoption Speed Justification: MMSs are going through a major market shift. Modern MMSs are supporting organizations that manage distributed and varied information assets. Moreover, demands for accessing and using data are no longer limited to IT, and new data-oriented citizen roles are emerging in the business. In addition, data and analytics leaders are facing greater regulatory pressures, such as privacy requirements that force new approaches to data management. Demand and hype for data catalog capabilities are growing, but many of these are solely limited to a single application and often primarily to an inventory of data assets. MMS vendors promise to deliver data cataloging capabilities and address all use cases, thus avoiding any building of metadata silos. As a result, MMSs, which moved significantly backward on the Hype Cycle last year, may now be accelerating forward, due to innovation and support from machine learning. We expect MMSs to take two to five years to reach the Plateau of Productivity as the technology continues to expand in terms of both capabilities and support for all four use cases. While still emerging in many organizations, the metadata management practice continues to grow, due to ever-expanding data and information volumes, along with regulatory compliance and business requirements to catalog and manage that information. Ultimately, metadata will become a critical input to machine learning approaches for dynamic data management solutions, and metadata solutions will evolve toward a graph-based analytical approach.

User Advice: Most organizations will find their current metadata management practices differ across applications, data and technologies, and that these practices are siloed by the needs of different disciplines and even software applications — each with their own governance authority, practices and capabilities. Data and analytics leaders who have already invested in data management technologies should first evaluate the metadata management capabilities of their existing data management tools, including data integration capabilities, before buying a modern MMS. However, if dealing with emerging use cases, including data and analytics governance, data risk and compliance, support for analytics and augmented data value, they should learn about, and experiment with, MMSs.

Business Impact: MMSs are relevant to several of the business requirements of enterprises, such as:

- **Management of complexity:** The complexity of data management depends on the complexity of data needs arising from applications, the variety of information and a growing number of information management use cases. MMSs help to break down and reduce the complexity often inherent in data.
- **Automation of processes:** Because data is subject to change, there are numerous recurring activities that MMSs may enable or streamline by (partial) automation — for example, creation,

publication, approval and revision. MMSs enable these activities and processes by the application of technology.

- **Collaboration:** At an enterprise level, metadata requires the contribution of numerous people from different divisions, countries, etc. An MMS can provide a multiuser environment able to address complex collaboration requirements. Additionally, an MMS can facilitate collaboration among data consumers and providers by enabling business-driven development of data management and its metadata.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Adaptive; Alation; ASG Technologies; Collibra; Data Advantage Group; Global IDs; IBM; Informatica; Oracle; SAP

Recommended Reading:

“Magic Quadrant for Metadata Management Solutions”

“The State of Metadata Management”

Application Data Management

Analysis By: Andrew White; Simon Walker

Definition: Application data management (ADM) is a technology-enabled business discipline in which business and IT work together to ensure the uniformity, accuracy, stewardship, governance, semantic consistency and accountability for data in a business application or suite, such as ERP, custom-made or core banking. Application data is the consistent and uniform set of identifiers and extended attributes maintained and/or used within an application or suite. Examples of such entities include customers, suppliers, products, assets, sites, and prices.

Position and Adoption Speed Justification: End users have long struggled to manage data within the context of business applications, even though almost all business applications assume authority of their own data. The tools offered by application vendors and developed by app developers have rarely focused on what is needed to govern and steward application data.

There are, in fact, three cases for managing data:

1. Master data is the least amount of descriptive or reference data that is widely shared and least changing across all the critical business processes and applications; it is a minimalist dataset.
2. Application data is all the other descriptive or reference data (not the resulting transaction) — much of which is not shared outside the application or suite.

3. Shared application data is a subset of application data that is shared across two or more business processes or applications, but not across all the critical business processes/apps.

Too many organizations govern data in the third case, as if it were master data in an Master Data Management (MDM) program leading to over ambitious, complex, expensive and ineffective governance. With a need for clearer delineation between application data, shared data and master data, organizations' interest in governing application data for better business outcomes is rising.

In the past year, end-user client interest in ADM, how this differs from MDM, and how to approach governance has risen. Associated business application vendor support remains patchy in terms of who supports and meets the clients' needs. SAP continues to drive ADM, albeit adding confusion in the market by referring to master data as "application data." Oracle leverages its own MDM capabilities to support its own Oracle cloud application customers manage their application data (ADM). EnterWorks and Winshuttle merged to create a more connected, end-to-end solution spanning MDM and ADM for "product 360" type solutions.

User Advice: Starting with a focus on business outcomes to identify what data matters most, organize and classify your data:

- **Master data** — Organizations implement MDM here; we refer to this as "global governance." There should only be one concerted MDM program for a given piece of data.
- **Application data** — Organizations implement ADM here; we refer to this as "local governance." Each application or suite may require its own implementation of ADM.
- **Shared (application) data** — Organizations should consider this as ADM or at least ADM-like; we refer to this as "regional governance." Treat this as a staged implementation with other ADM or MDM programs.

Demand from your packaged (on-premises or cloud) application provider the necessary capability to set (that is, govern) and enforce (that is, steward) information policy pertaining to data used in the application or suite. When this is lacking, look to MDM vendors to support this capability. Note that even if you obtain such capability from your application vendor, you may still need to integrate it into your MDM hub infrastructure.

Design your overall program independent of application data management capabilities to support your enterprise application architecture and landscape. It is also possible that some MDM solutions will negate the need for an additional application data management solution. Note that some vendors do not use the term "ADM" and instead use other names that are more appropriate to the context of the user, such as customer data hub, or customer interaction hub.

Implement ADM alongside any MDM program so that they can operate at their own speed and benefit. They do align and share metadata in support of a wider EIM program.

Business Impact: The primary benefactors of this discipline are business users, as in material planners, production planners and customer service reps., or markets, but not IT users. Business users will finally be able to steward and govern the application data needed within their specific business application or suite. Thus, this is a good first step in support of a widening of your MDM program, since ADM can now be coordinated with the very same governance and stewardship work

that is part of an MDM program. If you don't have an MDM program yet, you can still adopt ADM for each application, but your integration challenges with the shared (application or master) data will likely persist.

Many users of large packaged or industry-vertical applications believed that these applications or suites already helped them do a good job of managing the data used in them. They might, therefore, be shocked to find their strategic vendor partners developing solutions that accomplish what they thought the application package had been doing all along. Most often lacking is the capability's focus on governance and stewardship of the business rules, workflows and metrics reporting on data consistency across the application for the entirety of the data life cycle. However, the need to manage this data formally has emerged only recently due to the increasing complexity of application environments (even those labeled ERP) and the growing need to ensure a trusted view for data across organizations.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: BackOffice Associates; Chain-Sys; EnterWorks; Epicor Software; Oracle; PiLog; SAP; Utopia; Winshuttle

Recommended Reading:

"Design an Effective Information Governance Strategy"

"Toolkit: How to Classify Information Assets to Be Governed in Applications"

"Use the 7 Building Blocks of MDM to Achieve Success in the Digital Age"

"The Role of Technology in Data and Analytics Governance"

Multidomain MDM Solutions

Analysis By: Simon Walker

Definition: Multidomain master data management (MDM) is an enabling technology that supports the management of any number of master data domains across the full spectrum of MDM implementation styles. This can be achieved via implementation of either a single, integrated offering or a portfolio MDM offering.

Position and Adoption Speed Justification: Multidomain MDM continues its slow slide into the Trough of Disillusionment on the Hype Cycle. Despite the target market growing and more organizations becoming aware of its benefits, market adoption has continued to be slower than expected. There has been little consistency in how organizations define "multidomain" and how MDM vendors define a "multidomain MDM solution."

Furthermore, those organizations able to articulate their multidomain requirements and identify truly multidomain MDM solutions are beginning to realize that technology (and in fact, MDM) alone cannot deliver the promised additional benefits. Realization of multidomain benefits will stem from an assessment of requirements on a business process basis, along with the resultant organizational and process changes that the enabling technology will ultimately support.

User Advice: Organizations should continue to exercise caution in their approach to selecting multidomain MDM solutions in response to business requirements, until they are satisfied that their organization is ready for it from a program perspective. There must be use cases requiring multidomain MDM capabilities, and organizations must be able to select vendor technologies that fully support such requirements. In such cases, first assess the extent to which your organizational culture and design supports this, and whether effective information governance and enterprise metadata management can be established across different business areas and data domains in the enterprise.

For an end user, the adoption of a multidomain MDM solution will be dependent on:

- A specific vendor's ability to meet the necessary complexity across different data domains and provinces for desired use cases, implementation styles and industries.
- The organizational ability to establish and operate MDM design capabilities that serve business-as-usual operational needs for performance, reliability and security, above and beyond the basic functionality that is provided out of the box.
- Governance and stewardship maturity, political or cultural readiness, and the ability to establish organizational leadership across multiple business areas spanning multiple data domains.
- Explicitly evaluating the trade-offs when comparing several best-of-breed, domain-centric MDM offerings, such as MDM of customer data or MDM of product data, versus one generalist multidomain offering that can model multiple objects to some degree.

As increasing numbers of multidomain MDM solutions come to market, users need to explore and fully validate their business and IT readiness, as well as their MDM maturity. The technology adopted must match their organizational culture and business goals. Although likely to be a complex undertaking, organizations should complete proof-of-concept evaluations of candidate vendors and proposed solutions, where possible.

Business Impact: Multidomain MDM solutions provide the enterprise with the capability to achieve a consistent, trusted semantic view of some or all of its key master data domains. This offers significant advantages that accrue from strategic, enterprise-level information governance, management of consistent business data objects across organizational units, alignment of business data definitions and the effective execution of data stewardship. As such, multidomain MDM solutions support more-advanced enterprise information strategies that seek to support market differentiation using information as a business driver.

It is critical to understand that technology adoption alone does not ensure success, because greater effort is needed in terms of design, governance, business process and organizational change management.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Ataccama; IBM; Informatica; Profisee; Riversand Technologies; SAP; Semarchy; Stibo Systems; TIBCO Software

Recommended Reading:

“Magic Quadrant for Master Data Management Solutions”

“Critical Capabilities for Master Data Management Solutions”

“Use the 7 Building Blocks of MDM to Achieve Success in the Digital Age”

“Select the Best Master Data Management Implementation Styles for Your Needs”

“Toolkit: RFP Template for Master Data Management Solutions”

Information Stewardship

Analysis By: Guido De Simoni

Definition: Information stewardship is the process of monitoring, controlling, analyzing and enforcing the approved data and analytics governance policies across applicable business areas and processes. Information here includes data, analytics, algorithms, documents, images, metadata — in other words, any and all information assets as needed.

Position and Adoption Speed Justification: The recognition that effective data and analytics governance and advocacy is a critical requirement for any enterprise information management (EIM) program, such as master data management (MDM), application data management (ADM) or business intelligence and analytics, has resulted in wider yet limited acceptance of information stewardship. Despite the wider acceptance of information stewardship needs, many organizations have relied on the heroic efforts of “citizen stewards” to solve data problems holding outcomes and decisions back. Organizations are not yet, en masse, ready or invest the necessary money and time in the right solutions or training of their business users to assure an operational function for stewardship. In the recent past, we have seen organizations maturing in this area however still trying to shape information stewardship (even within business areas) by testing and validating the approach before committing to an established discipline.

User Advice: If information stewardship already exists in IT, the movement of aligned roles within the jurisdiction of a business operational area should be investigated and appropriate action should be taken since the knowledge needed for the work does not exist in IT. Where strategic programs such as records management, MDM or compliance are underway, organizations should also commit to information stewardship that spans multiple business areas, and potentially identify a lead information steward. Where a chief data officer is in place, the relationship with the business area

information stewardship process should be made clear and the reporting lines for information stewards should be established so that they are consistent with the desired business outcomes. IT can execute the instructions and results of stewardship (e.g., data maintenance or policy execution).

Recommendations:

- You should not hire an information steward from outside your organization (they won't have the business acumen or context needed to enforce policies).
- The work of policy enforcement cannot be outsourced because of the lack of context/business domain knowledge of the outsourcing partners.
- Organizations with established information stewardship practices should evaluate and implement information stewardship practices, processes and enabling technology.

Business Impact: Information stewardship as an established discipline is key to ensuring that effective data and analytics governance is executed in business areas in accordance with prioritized business outcomes.

Gartner research demonstrates that most companies suffer from poor data quality — at least in some part of their organizations. Poor-quality information leads to bad decisions, regulatory compliance failures, competitive disadvantages and a host of other problems. Simply put, poor-quality data costs the organization money and increases its exposure to business risks. Records management is similarly impacted by information stewardship issues where poor information handling and mismanagement of information classification and retention schedules can lead to increased costs, greater exposure to risk and regulatory fines.

The primary risk of undertaking systematic information stewardship in an organization is that it requires focused time from business experts who will therefore have less time to spend on other duties. Enabling technology can make information stewardship more efficient, but in most cases, expecting people to do it “in their spare time” as citizen stewards or as some kind of adjunct to their other responsibilities will result in nonperformance of data stewardship duties. Stewardship must be made an organizational and personal priority.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Recommended Reading:

“Toolkit: Data Stewardship Role Descriptions”

“A Day in the Life of an Information Steward”

Master Data Management

Analysis By: Simon Walker; Sally Parker; Bill O’Kane

Definition: Master data management (MDM) is a technology-enabled business discipline in which business and IT work together to ensure the uniformity, accuracy, stewardship, governance, semantic consistency and accountability of the enterprise's official shared master data assets. Master data is the consistent and uniform set of identifiers and extended attributes that describes the core entities of an enterprise, such as existing customers, prospective customers, citizens, suppliers, products, assets, sites, hierarchies and the chart of accounts.

Position and Adoption Speed Justification: A trusted version of master data domains remains a central component in the pursuit of digital business goals. MDM is a strategic program that can require several years. The need for business case creation and program management, and the requirement to deploy information governance, restricts MDM's success to organizations that fulfill these requirements. The technical challenge is to align the technical capabilities of MDM (such as data integration and data quality) in a fashion that supports business requirements.

The market penetration of MDM as a whole is still low due to the technical and organizational complexity of implementation (often compounded by a lack of understanding of the differences between master data and application data), but the technical profiles for MDM for some single-data-domain implementations (such as customer and product data) have now reached the Slope of Enlightenment ahead of the position for MDM overall. Confusion also reigns when it comes to defining what is master data; and so the greater majority of data in any and all applications — application data — is often confused with also being master data and so part of the MDM program (which it is not). Demand is again being driven by the pursuit of the “360-degree view” of critical data (which actually leads to integration of MDM and ADM along with other data), but MDM is now just beginning to leave the Trough of Disillusionment as organizations better understand the challenges, but are still most often unable to surmount them without substantial external guidance.

User Advice: Organizations with complex or heterogeneous application and information landscapes typically suffer from inconsistent master data, which in turn weakens business-process integrity and outcomes. Any number of business applications may be affected, including customer-facing, supplier-facing, enterprisewide and value chain applications.

If your business strategy depends on the consistency of data within your organization, you will likely consider MDM as one enabler of this strategy.

Companies investigating MDM should:

- Ensure a clear “line of sight” to business benefits and sponsorship. Understand which business initiatives require better master data to succeed, and explain the need for MDM to appropriate stakeholders.
- Identify one or more solutions for the most important master data in your organization, such as customer, product and financial data, based on business process enablement and optimization. Plan on using the solution(s) for at least the next several years as changing incumbent MDM solutions can be quite challenging. Look for solutions that support a holistic implementation and end-user experience across domains, use cases and implementation styles.

- Identify the architectural role that each implemented MDM solution will play in your approach to enterprise information management (EIM). Use MDM as an opportunity to implement sound information architecture fundamentals, such as canonical transaction formats for master data domains as part of a well-managed data integration practice.
- Use previous experiences in dimensional data development for business intelligence initiatives to identify your organization's most fragmented but reused data domains. Begin your MDM efforts with those domains and expose newly managed master data early in analytics platforms.
- Avoid confusion and hype related to MDM and ensure that it is supported with the appropriate level of discipline and technology, for example, application data management.
- Classify only the most widely shared application data as master data in order to focus “the least amount of data governance on the least amount of data that has the greatest impact on business outcomes” and treat all other less-shared application data as subject to ADM.

Business Impact: Leading organizations that create a strategy to implement MDM and supporting technology that is well-thought-out, holistic and business-driven will be able to deliver significant business value. They will do so in terms of enabling competitive differentiation and business growth, improved customer experience, reduced time to market and delivery on operational efficiency as well as by meeting governance, risk management and compliance requirements.

MDM strategies that are linked to strategic IT enterprise transformation efforts (such as ERP and CRM implementations) provide significant additional value to those efforts. Conversely, MDM-centric business cases are often used to highlight opportunities for significant business process optimization.

In some cases, we have seen the need for MDM to trigger improvements in other areas such as data quality, information governance, enterprise metadata management, although conversely, we have also seen those programs initiate the need for better master data management.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Ataccama; IBM; Informatica; Profisee; Reltio; Riversand Technologies; SAP; Semarchy; Stibo Systems; TIBCO Software

Recommended Reading:

“Magic Quadrant for Master Data Management Solutions”

“Use the 7 Building Blocks of MDM to Achieve Success in the Digital Age”

“Mastering Master Data Management”

“Create a Master Data Roadmap With Gartner’s MDM Maturity Model”

Climbing the Slope

MDM of Customer Data

Analysis By: Bill O’Kane; Michael Moran; Simon Walker

Definition: Master data management (MDM) of customer data enables business and IT organizations to ensure the uniformity, accuracy, stewardship, governance, semantic consistency and accountability of an enterprise’s official shared customer master data assets (including concepts such as patient/provider in healthcare and citizen in the public sector). Such implementations enable the authoring of customer master data in workflow-, batch- or transaction-oriented processes that conform to one or more MDM implementation styles (or a hybrid of those styles).

Position and Adoption Speed Justification: The need for consistency of customer master data across business silos continues to drive the MDM of customer data market. Digitalization requires a unified view of the customer, which in turn depends on trusted customer master data. Organizations must integrate new data sources (often externally generated) to traditional customer activity. The race toward digitalization of business is, therefore, putting increased pressure on MDM of customer data efforts. MDM vendors are creating MDM-based business applications, and continue to develop cloud-based offerings and integration to commercial business applications, along with social networks, big data and mobile initiatives.

MDM of customer data continues to progress along the Hype Cycle as adoption has increased. But progress continues to be inhibited by failures due to inadequate program preparation and justification. Domain-specific MDM solutions and implementations are approaching the Plateau of Productivity more rapidly than MDM in general is, but will require at least two more years to reach it. Domain-specific implementations continue to progress toward being seen as part of a larger MDM program or ecosystem. Additionally, confusion over what is master data, versus application, transaction or relationship data, continues to be a drag on effective scope and progress toward a successful implementation.

User Advice: Organizations with customer data (including concepts such as patient/provider in healthcare and citizen in the public sector) that is fragmented across systems should implement MDM of customer data. They should do so in a style that integrates with established source systems and enables it to become the system of record for customer master data. MDM of customer data programs typically focus on improving operational business processes, but can also have benefits for downstream analytical environments. If you are looking to provide real-time, in-process analytics, MDM can improve those as well.

A successful MDM program is not just about technology. It is also about the need to create a business-driven MDM of customer data vision and strategy that focuses on key business problems. It is important to pursue a long-term MDM vision above any lower-level technology strategy or solution capability, and to approach the individual projects of an MDM of customer data program based on business priorities. An MDM of customer data strategy should be part of a wider

multivector MDM implementation strategy, which adds additional capabilities to the multidomain approach:

- The ability to meet requirements spanning multiple usage scenarios, implementation styles and data domains
- Any governance and organizational models supporting MDM

An MDM program is a key part of data and analytics, enabling greater enterprise agility, and should complement the need to govern application data for specific applications.

Evaluate these solutions based on their capabilities for data modeling, data quality, integration, data stewardship and information governance, business services and workflow, measurement, and manageability. Additionally, consider multivector MDM, cloud-based and social data interface capabilities that may become important. Ancillary technologies, such as enterprise service bus or an analytics platform, may also be required to accomplish your business goals.

Business Impact: Trusted customer data and a trusted 360-degree view of the customer are fundamental to the success of any digitalization of business strategy or supporting element, such as a CRM or CX strategy. MDM programs and solutions are key components of these initiatives. The ability to identify customers correctly, and to draw on a trusted, accurate and comprehensive single customer view in customer-centric processes and interactions, is valuable for marketing, sales and service functions, and for other functions that interact with customers. It can help organizations:

- Deliver the appropriate CX
- Cross-sell across products and markets
- Retain customers
- Execute end-to-end processes in an efficient and effective manner
- Manage risk and enable regulatory compliance

In the era of social networks and other forms of big data, MDM of customer data is key to managing the linkages across the silos of customer data in these new data sources. It enables a trusted understanding of customers' sentiment and behavior.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Ataccama; IBM; Informatica; Profisee; Reltio; SAP; Semarchy; Talend; TIBCO Software

Recommended Reading:

"Magic Quadrant for Master Data Management Solutions"

“Use the 7 Building Blocks of MDM to Achieve Success in the Digital Age”

“MDM Is Critical to CRM and Customer Experience”

MDM of Product Data

Analysis By: Simon Walker

Definition: Master data management (MDM) of product data enables organizations to ensure the uniformity, accuracy, stewardship, governance, semantic consistency and accountability of an enterprise’s official shared master product data assets. Such implementations enable the authoring of master product data in workflow-, batch- or transaction-oriented processes that conform to one or more MDM implementation styles (or a hybrid of those styles). Though mastered similarly to products, IoT “things” are defined as a separate data domain.

Position and Adoption Speed Justification: Digitalization continues to drive broader business initiatives such as digital commerce and demand-driven supply chains that, in turn, drive expanded and increasingly complex requirements for end-to-end product data across a spectrum of use cases.

MDM vendors are responding to provide the means for creating semantically consistent master products throughout the enterprise ranging from interaction with suppliers (procure to pay) to internal (order to cash) to customers (commerce) and beyond (product data syndication).

For “thing” data in the context of the IoT, Gartner foresees the requirement (which is not yet registering as a demand within the broader market) for semantically consistent master thing data to span the distributed IoT architecture to provide from edge to OT/IT environments.

The race to digital deployment is creating increased pressure on current information management and governance efforts. This technology has continued to progress slowly along the Hype Cycle for a number of years, yet continues to be inhibited by failures due to inadequate program preparation.

User Advice: Large and midsize organizations with complex data architectures should look to procure packaged enterprise MDM solutions capable of mastering product data. This solution should integrate with established source systems and, where appropriate, become the system of record for master product data.

Important elements to consider include:

- Making MDM of product data part of your overall MDM strategy.
- Focusing on business outcomes when seeking to govern product master data.
- Reviewing your organization’s capabilities and readiness, as well as comparing your findings with current and potential challenges.
- Creating a vision for what can be achieved.
- Focusing on key business problems and building business cases based on benefits.

- Monitoring vendor capabilities for multidomain and multivector MDM, as well as for information stewardship.
- Evaluating vendors based on references, not hype.
- Ensuring an MDM of product data solution has rich, tight-knit capabilities, including a comprehensive data model, information quality tools, a workflow engine and integration infrastructure.
- Thinking strategically and acting tactically, by delivering early and often.
- Recognizing that not all product data is master data — much will be shared by fewer and less critical applications and so that application data should be managed and governed in a related but different program.

Business Impact: Inconsistent master product data can prove costly — especially as digitalization of business processes magnifies data issues. Inconsistent data will slowly erode an organization's ability to perform and achieve its goals. Unchecked or poor data will, over time, increasingly consume the resources and capacity required for innovation in the challenge to address it.

Effective implementation will help to deliver a range of benefits, including:

- Increased revenue through better upselling, cross-selling and identification of white space.
- Enhanced customer experience through improved fulfillment.
- Reduced time to market for new products and services.
- More efficient business process optimization within ERP.
- More effective product profitability and performance analysis.
- Regulatory compliance in industries where this is required.
- Enable digital twins in the context of IoT.

MDM of product data has an impact on all business applications and intelligence data stores as it becomes the centralized governance framework for all with respect to master product data.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Contentserv; EnterWorks; IBM; Informatica; Riversand; SAP; Stibo Systems; TIBCO Software; Viamedici

Recommended Reading:

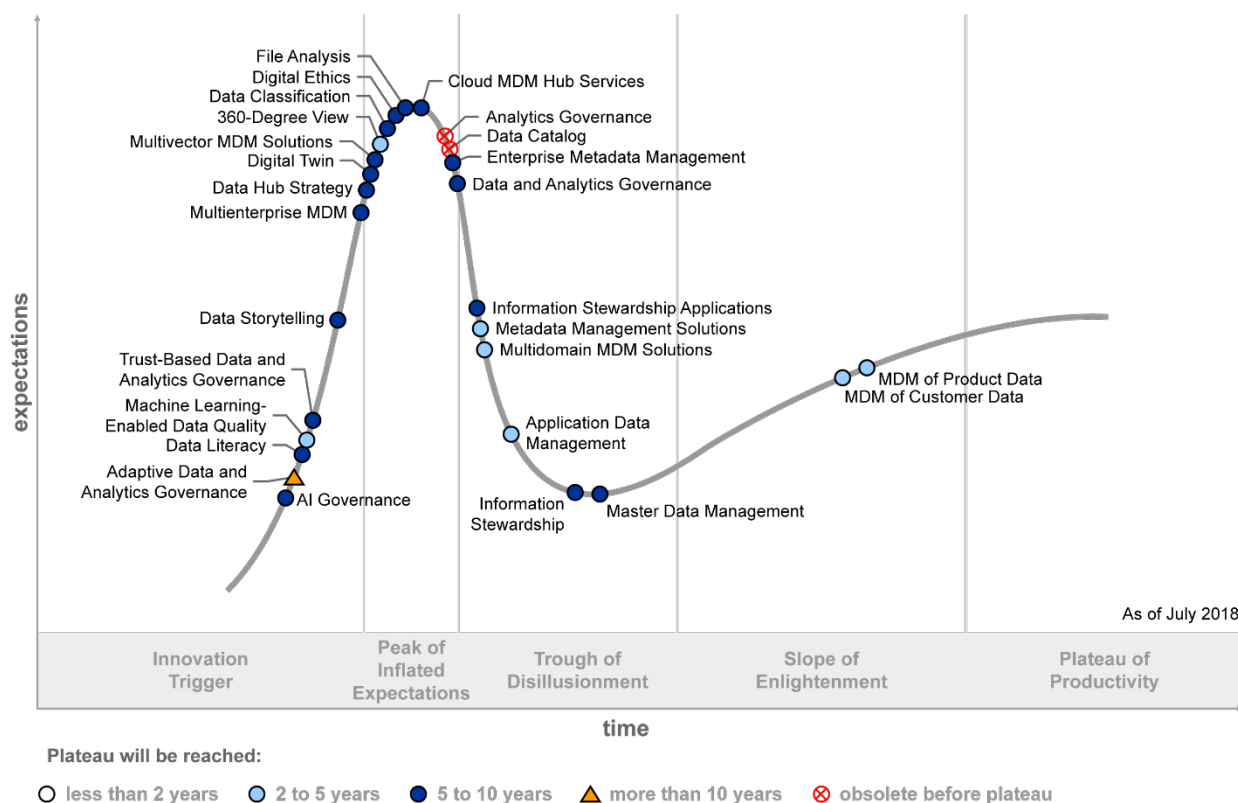
“Magic Quadrant for Master Data Management Solutions”

“Critical Capabilities for Master Data Management Solutions”

“Use the 7 Building Blocks of MDM to Achieve Success in the Digital Age”

Appendixes

Figure 3. Hype Cycle for Information Governance and Master Data Management, 2018



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Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 1. Hype Cycle Phases

Phase	Definition
<i>Innovation Trigger</i>	A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.
<i>Peak of Inflated Expectations</i>	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the technology is pushed to its limits. The only enterprises making money are conference organizers and magazine publishers.
<i>Trough of Disillusionment</i>	Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
<i>Slope of Enlightenment</i>	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
<i>Plateau of Productivity</i>	The real-world benefits of the technology are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
<i>Years to Mainstream Adoption</i>	The time required for the technology to reach the Plateau of Productivity.

Source: Gartner (July 2019)

Table 2. Benefit Ratings

Benefit Rating	Definition
<i>Transformational</i>	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
<i>High</i>	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
<i>Moderate</i>	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
<i>Low</i>	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2019)

Table 3. Maturity Levels

Maturity Level	Status	Products/Vendors
<i>Embryonic</i>	<ul style="list-style-type: none"> In labs 	<ul style="list-style-type: none"> None
<i>Emerging</i>	<ul style="list-style-type: none"> Commercialization by vendors Pilots and deployments by industry leaders 	<ul style="list-style-type: none"> First generation High price Much customization
<i>Adolescent</i>	<ul style="list-style-type: none"> Maturing technology capabilities and process understanding Uptake beyond early adopters 	<ul style="list-style-type: none"> Second generation Less customization
<i>Early mainstream</i>	<ul style="list-style-type: none"> Proven technology Vendors, technology and adoption rapidly evolving 	<ul style="list-style-type: none"> Third generation More out-of-the-box methodologies
<i>Mature mainstream</i>	<ul style="list-style-type: none"> Robust technology Not much evolution in vendors or technology 	<ul style="list-style-type: none"> Several dominant vendors
<i>Legacy</i>	<ul style="list-style-type: none"> Not appropriate for new developments Cost of migration constrains replacement 	<ul style="list-style-type: none"> Maintenance revenue focus
<i>Obsolete</i>	<ul style="list-style-type: none"> Rarely used 	<ul style="list-style-type: none"> Used/resale market only

Source: Gartner (July 2019)

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

Understanding Gartner's Hype Cycles

Adopt SMART Information Principles for Effective Data and Analytics Governance

Use a Data Hub Strategy to Meet Your Data and Analytics Governance and Sharing Requirements

5 Steps to Build a Business Case for Data and Analytics Governance That Even Humans Will Understand

MDM Is Critical to Maximizing CRM and Customer Experience

Use the 7 Building Blocks of MDM to Achieve Success in the Digital Age

Five Ways to Use Metadata Management to Deliver Business Value for Data

Create a Master Data Roadmap With Gartner's MDM Maturity Model

Use Enterprise Metadata Management to Extend Information Governance to Analytics

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