Hype Cycle for Data and Analytics Governance and Master Data Management, 2020

Published: 16 July 2020   **ID:** G00441544

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Data and analytics leaders can use this Hype Cycle to understand the latest trends and innovations driving 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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What You Need to Know

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

Data and analytics leaders are faced with enterprisewide and business area 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 for them to take strategic decisions based on trusted data, resulting in greater inflexibility, complexity and cost to the business. Furthermore, as organizations move into the reset phase following COVID-19, interest in governance and MDM among data and analytics leaders is more acute than ever, as new ways to exploit and refocus data and analytics are sought.

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 and includes applications such as ERP and CRM, data lakes, data science labs, analytics, content and artificial intelligence (AI). In this context, MDM enables a consistent, enterprisewide understanding of key master data.

To succeed with data and analytics initiatives, enterprises must develop a holistic view of critical technologies and capabilities for data and analytics governance and MDM. Including this one, there are eight Hype Cycles for 2020 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.

The other seven Hype Cycles covering data and analytics are:

- "Hype Cycle for Analytics and Business Intelligence, 2020"

- "Hype Cycle for Artificial Intelligence, 2020"

- "Hype Cycle for Customer Experience Analytics, 2020"

- "Hype Cycle for Data Management, 2020"

- "Hype Cycle for Data Science and Machine Learning, 2020"

- "Hype Cycle for Data Security, 2020"

- "Hype Cycle for Enterprise Information Management, 2020"

The Hype Cycle

The COVID-19 reset has been one of the largest disruptive forces globally in decades (see "The Postpandemic Planning Framework"). Although all organizations have been impacted, responses have varied across different industries and geographies. For data and analytics leaders, the primary

focus during this crisis has been delivering data and analytics services for mission-critical operations. Although there is no shortage of digital business technologies, data and analytics leaders struggle to scale them across the enterprise because their internal *business practices* — such as data and analytics governance and MDM — fall short of what is needed. As organizations then turn to new 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 on this Hype Cycle focus on discrete practices, disciplines, technologies and services in direct support of data and analytics governance and MDM projects, programs, products and services.
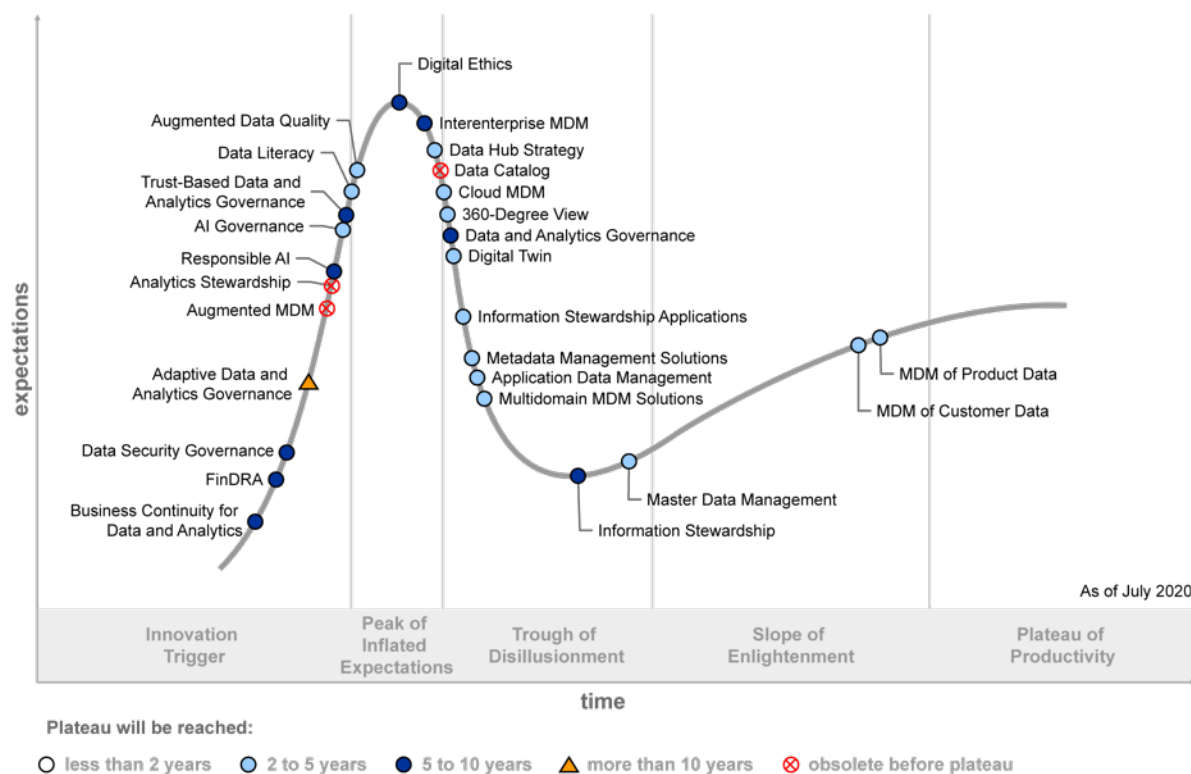
The hype around data and analytics governance reached its peak four years ago, when overinflated expectations that it was the answer to all organizational woes were widespread. Since then, there has been growing recognition that data and analytics governance is complex, organizationally challenging and politically sensitive. It is often difficult for data and analytics leaders to get executive-level consensus for data and analytics governance programs, since too many organizations wrongly equate governance with compliance or don't understand its close connection with business outcomes. Such cultural issues have also resulted in investments in governance technologies falling short of expectations. As a result, we are seeing the overall hype for data and analytics governance slowly descend on the Hype Cycle.

As the post-COVID-19 reset enables recovery, we see innovations in data and analytics, AI and the Internet of Things (IoT) being deployed in this new context. Consequently, we see adaptive governance, AI governance and trust-based data and analytics governance gaining in market hype, as organizational interest and expectations accumulate and push these innovations further toward the peak of the 2020 Hype Cycle.

Though MDM is leaving the Trough of Disillusionment on the Hype Cycle, its journey to the Plateau of Productivity will be slow. This is mostly due to the confusion over the scope of what is master data, and the inability for organizations to link the work of governing master data to specific business outcomes. It remains a complex and maturing undertaking because technology is often mistakenly seen as a panacea. MDM technology is insufficient by itself to solve a problem that traverses people, process and technology across the enterprise. Nevertheless, we continue to see organizations explore new technologies, such as augmented MDM, and increasing hype in others, such as 360-degree view and application data management. MDM vendors have actively sought to lower the barrier to entry to adoption with subscription pricing, cloud offerings, simpler products and rapid deployment tools.

Figure 1. Hype Cycle for Data and Analytics Governance and Master Data Management, 2020

Hype Cycle for Data and Analytics Governance and Master Data Management, 2020

The Priority Matrix

Data and analytics governance and MDM aim to increase the business value of data and analytic assets through higher levels of oversight, integrity and trust. By doing so, better efficiency and productivity of established business processes can be realized, supporting business growth. However, it is critical that investment decisions in data and analytics governance and MDM are taken with awareness of their hype, maturation and relative impact of technologies and innovations upon the organization. The Priority Matrix, shown in Figure 2, helps data and analytics leaders make better informed decisions on the value and timing of their investments.

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, augmented data quality, and application data management.

More-complex innovations, such as adaptive data and analytics governance, 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.

Priority Matrix for Data and Analytics Governance and Master Data Management, 2020

benefit	years to mainstream adoption			
	less than two years	two to five years	five to 10 years	more than 10 years
transformational		Digital Twin	Business Continuity for Data and Analytics Data Security Governance FinDRA	Adaptive Data and Analytics Governance
high		360-Degree View AI Governance Augmented Data Quality Data Hub Strategy Data Literacy Information Stewardship Applications Master Data Management MDM of Customer Data MDM of Product Data Metadata Management Solutions Multidomain MDM Solutions	Data and Analytics Governance Digital Ethics Information Stewardship Interenterprise MDM Responsible AI Trust-Based Data and Analytics Governance	
moderate		Application Data Management Cloud MDM		
low				

As of July 2020

Source: Gartner
ID: 441544

Off the Hype Cycle

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

- **Data classification —** We have seen the hype for data classification drop over the past year. In the context of data and analytics governance and MDM, data classification has not featured as much in our client inquiries and engagements.

- **Content integration services —** Though content is a key aspect of assets that organizations must govern, the hype for content integration services has fallen off in relation to other innovation profiles on this Hype Cycle.

- **Enterprise metadata management —** Although metadata management solutions remain hyped in the context of data and analytics governance and MDM, its related practice (i.e., the enterprise metadata management discipline) is relatively hyped in comparison with other innovation profiles. It does, of course, remain key in other contexts — e.g., enterprise information management.

- **Data storytelling —** We have seen the hype for data storytelling fall over the past year. It is possible that this can be partially attributed to the refocus of data and analytics activities on supporting critical business operations, as a result of COVID-19.

- **Analytics governance —** As organizations increasingly address the governance of their data and analytics together, the hype for analytics-only governance has fallen. Instead, we have seen elevated hype in analytics stewardship, as teams focus efforts on enforcing policies in analytics applications.

- **Multivector MDM —** Hype for multivector MDM has fallen, as the MDM market has matured to a point where the five vectors of MDM complexity (industry, data domains, usage scenarios, organizational structures and implementation styles) have become typical in product offerings.

On the Rise

Business Continuity for Data and Analytics

Analysis by: Saul Judah; Andrew White

Definition: Business continuity management for data and analytics is an emerging discipline that enables evaluation and redirection of the role played by data and analytics in addressing operational risks and business impacts. Aligned with enterprise business continuity management, it focusses on the role of data and analytics in planning for, responding to, recovering from and helping to restore the organization after a business disruption.

Position and Adoption Speed Justification: The impact of COVID-19 on organizations has caught many data and analytics (D&A) leaders off-guard. Until now, data and analytics leaders have primarily focused their efforts on business-demand-led initiatives (e.g., GDPR, customer 360, cost optimization) and supporting business-as-usual operations (e.g., supply chain management, customer onboarding). Though enterprise business continuity management (BCM) has been in operation in organizations for many years, data and analytics leaders have typically been its clients, rather than being active leaders in its enablement. When the outbreak of COVID-19 forced organizations to rapidly decentralize its governance and management of business operations, many data and analytics leaders struggled to provide uninterrupted data and analytics services for critical business operations. They also realized the need to be able to see and analyze the COVID-19 impact on various business operations, products and services. Other than addressing the current data and analytics challenges posed by COVID-19, data and analytics leaders are beginning to explore how, in future, they might be better prepared to respond to significant disruptive events.

Therefore, business continuity management in the context of data and analytics is beginning to get hyped.

User Advice: Business continuity management is a team sport, and all parts of the enterprise have a role to play. As a team sport, it requires orchestration. Therefore, the strategy and approach taken to business continuity in data and analytics must be consistent with and led by the business continuity leader. The role of the data and analytics leader is to bring real-time insights to the current situation and greater resilience to their data and analytics capability. By doing so, they can better manage the current crisis and prepare provision of continuous essential services to business-critical functions in future catastrophic events. Data and analytics leaders can take the following initial actions:

- First, learn lessons from the current crisis. Analyze what worked and what failed. Work with the business continuity management team to conduct your assessment and ensure (without attributing blame) the entire data and analytics team is brought into the discussion.

- Ensure the scope of your business continuity plan is clear and agreed with senior business leaders and the BCM team. This scope will be based on the key organizational areas, critical enterprise functions and interdependencies between business areas and critical functions. Using this scope, identify the data and analytics assets needed, the business and operational roles that need them, and the acceptable service levels for crisis-mode business operations. Engage your SI partners and vendors in this discussion, and seek guarantees from them to ensure they understand their role in crisis events.

- Assign the business continuity role to a team member with mid-level seniority. Empower them to work with the enterprise BCM team to develop and then lead the business continuity strategy for data and analytics, based on the agreed scope. Verify that this strategy complies with and supports existing business, legal and regulatory requirements. Communicate this plan widely across the organization, and confirm critical roles receive the right training in their role during a crisis event.

Business Impact: Business continuity management for data and analytics will benefit every organization that wants to ensure uninterrupted provision of data and analytics services to their critical business operations during an organizational crisis, and resumption of a full service afterward. Business areas need assurance that in a crisis situation, they will continue to receive an essentials-only data and analytics service, that enables them to continue business-critical activities, such as serving their customers, operating their supply chain and meeting compliance and regulatory requirements. If it is used to its complete potential, it should be driven by an enterprise data and analytics governance function, under the direction of the chief data officer (CDO).

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Recommended Reading:

"7 Must-Have Foundations for Modern Data and Analytics Governance"

"React to the Coronavirus (COVID-19) Outbreak via Raising Business Model Resilience"

"Tool: 6 Ways Data and Analytics Leaders Can Serve Their Organizations in the COVID-19 Crisis"

"Don't Make Predictions and Choices, Instead Create Options by Using Scenario Planning for Pandemic Recovery"

FinDRA

Analysis by: Brian Lowans; Khushbu Pratap; Alan D. Duncan

Definition: A financial-based data risk assessment provides a method to prioritize financial investment opportunities for data based upon balancing monetization options against business risks. FinDRA uses infonomics to analyze the business risks identified through data security governance and then prioritize the financial impact of each business risk caused by security, privacy or processing incidents.

Position and Adoption Speed Justification: Every digital business project can exploit the untapped value opportunities for data. But this desire is accompanied by prolific growth of business risks that may create financial impacts. Unfortunately, business leaders continue to separate the decision processes for data investments and monetization opportunities from the associated costs or liabilities. Financial-based data risk assessment (FinDRA) is an early-stage methodology that can be used jointly by business leaders such as chief data officer (CDO), chief information security officer (CISO) and chief privacy officer (CPO). FinDRA creates a defensible strategy and budget for data security, privacy 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 liabilities of opportunity costs, waste and risk 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. Use infonomics to evaluate the tangible and intangible liabilities of managing, storing, analyzing and protecting the data. Then evaluate FinDRA as a five-step process:

1. Establish the data security governance (DSG) framework to identify all essential datasets and associated business risks.

2. Apply an evolving data risk assessment (DRA) to identify how inadequate data security or privacy may create business risks.

3. Use infonomics to evaluate how the business risks for each dataset affect revenue or net asset value.

4. Use FinDRA to prioritize business risks according to financial metrics.

5. Use FinDRA to establish a defensible security budget to mitigate prioritized business risks that result from an evolving DRA.

The relative financial impacts can be represented by a financial risk prioritization that compares net "asset" value against "liability" impact. 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 significantly enhanced by FinDRA. Some vendor products are available that analyze cyber-risk quantification and only focus on the financial liabilities. Organizations have an opportunity to use FinDRA as a repeatable, consistent financial risk methodology to enable direct collaboration between CISOs and other business leaders such as the CDO. This can help create data security and data management strategies with board-level approval of defensible security budgets and investments.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Arx Nimbus; Axio; Corax; Emergynt; Guidewire; Nehemiah Security; RiskLens

Recommended Reading:

"Use Infonomics to Quantify Data Monetization Risks and Establish a Data Security Budget"

"Develop a Financial Risk Assessment for Data Using Infonomics"

"Use the Data Security Governance Framework to Balance Business Needs and Risks"

Data Security Governance

Analysis by: Brian Lowans; Bart Willemsen

Definition: The data security governance (DSG) framework enables the assessment, prioritization and treatment of business risks caused by security, data residency, privacy and other incidents that affect data.

Position and Adoption Speed Justification: The DSG framework offers a balanced approach to define how practical data protection can be implemented through data security and privacy controls. Each dataset has a different business purpose, and different business and security risks. DSG requires cross-collaboration among CISOs, CDOs and business leaders to 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 that adequate privacy impact assessments are integrated through DSG.

User Advice: The DSG framework is constructed to manage security policies across a portfolio of datasets. The flow and analytics applied to each dataset will create policy decisions based on privacy, confidentiality, integrity, availability, purpose and lifetime issues. However, organizations typically need to deploy dozens of security products. However, each product is siloed, due to the security functionality, the controls it offers and/or the data storage on which it operates. No single security product or control will mitigate a business risk sufficiently. Therefore, DSG is critical to assess how security policies can be orchestrated through the various product controls, and to identify and minimize gaps or inconsistencies in how these controls are applied. These gaps and inconsistencies create the need to develop a continuous data risk assessment (DRA). The DRA forms the basis for assessment and creation of security policies that are required under DSG. These policies are based on three basic principles:

- **Data —** Each dataset has business purposes and risks that need to be governed.

- **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 artificial intelligence (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 by DSG 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.

- Identify inconsistencies or gaps in each user's access to datasets.

- Identify potential roadmaps to synchronize and orchestrate more-consistent policies.

- Identify the 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, because 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 the CDO and the CISO are essential to reduce redundancy and waste.

Business Impact: Organizations focused on digital business strategies are seizing opportunities for growth by creating value from the increasing velocity, volume and variety of datasets. However, they face huge challenges to treat the growth of associated business risks arising from security and compliance issues. Additional security, privacy, trust and life cycle control issues grow, as data is shared with partners and ecosystems. Gartner's DSG framework enables the assessment and prioritization of business risks and allows organizations to establish a defensible data security strategy.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Recommended Reading:

"Use the Data Security Governance Framework to Balance Business Needs and Risks"

"Use Infonomics to Quantify Data Monetization Risks and Establish a Data Security Budget"

"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. 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.

The impact of COVID-19 upon organizations has led data and analytics leaders to focus on operational and business-critical issues in the short term. Therefore, adopting the adaptive data and analytics governance framework has understandably not been their priority, and as a result, its hype

has temporarily stalled. As organizations move into recovery and investment in data and analytics resumes, its hype will 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 an enabler 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:

"7 Must-Have Foundations for Modern Data and Analytics Governance"

"Reset Your Information Governance Approach by Moving From Truth to Trust"

"Data and Analytics Leaders Must Use Adaptive Governance to Succeed in Digital Business"

"IT Score for Data and Analytics"

Augmented MDM

Analysis by: Malcolm Hawker

Definition: Augmented MDM is the application of graph, AI/ML, NLP, and similar technologies to master data management. Augmented MDM extends traditional MDM capabilities to reduce some manual data stewardship and discovery tasks, and enables the creation of contextual application data by exposing previously unknown relationships between master and application data attributes.

Position and Adoption Speed Justification: Augmented master data management (MDM) is an evolving discipline in the early stages of development, both from the perspectives of customer demand and vendor focus. It suffers a lack of consistent definition and many MDM vendors claim to provide the functionality, but all in varying degrees. Individual capabilities described by augmented MDM are available across other data and analytics solutions (like data quality solutions) but are emerging as core components of MDM platforms. The primary obstacles of a broader availability are technical, in that MDM software vendors must upgrade their platforms to integrate new features into existing workflows and infrastructures — which for many represents a revamping of their underlying architectures. Companies seeking the full benefit of augmented MDM will typically adopt cloud-based MDM deployments, a migration many have yet to make. We expect both of these obstacles to be largely overcome in the next one to two years, with a broader availability from MDM vendors or from vendors in adjacent categories and wide-scale adoption shortly thereafter.

User Advice: We advise data and analytics leaders to be sceptical when working with MDM vendors who focus their value propositions primarily around augmented MDM capabilities. This is because many MDM end-user requirements, particularly in the realms of legal, finance, or compliance-driven use cases, remain firmly rooted in more traditional approaches to MDM. Data and analytics leaders must understand their expected business outcomes and detailed use cases — which may not well-align to augmented MDM regardless of vendor.

Vendors of augmented MDM solutions generally focus on the use of graph and AI for data discovery, profiling, visualization, and some forms of enhanced entity resolution capabilities. But, they may lack the ability to deeply integrate these functions in support of governance processes and operational MDM use cases. Augmented MDM solutions may offer some cost savings through automated data quality tasks, but data and analytics leaders need to recognize that most governance and stewardship processes are highly human-dependent. Data and analytics leaders with incumbent solutions lacking augmented MDM capabilities may consider a "best-of-breed" approach to solving for their needs, as a combination of MDM, customer data platforms, analytics platforms, data quality, and metadata management tools could support augmented MDM requirements for specific use cases. Data and analytics leaders with a primary focus on producing 360-degree views may find their requirements better suited toward existing augmented MDM solutions. Data and analytics leaders seeking solutions for "self-healing" data or other fully

automated approaches to MDM will find the existing augmented MDM solutions lacking — likely for several years to come.

Business Impact: Augmented MDM supports digital transformation requirements by exposing relationships between master data objects (like a "customer" or an IoT "thing") and nonmaster data (i.e., application data or other attributed data) within large, unstructured datasets. Creating and persisting these relationships in an MDM hub precludes the need to integrate these insights from downstream analytical platforms. Augmented MDM solutions allow for greater levels of automation around data governance and stewardship tasks and may indirectly support improved business outcomes by increasing the accuracy and consistency of governance processes using AI/ML, such as entity resolution.

Augmented MDM solutions offer companies with large amounts of master data potential infrastructure savings by providing more cost-efficient ways for the storage of and compute of master data, particularly the resources required for entity resolution of extremely large datasets. This is done by using graph, AI, and other approaches for entity resolution which do not rely on relational data stores or compute-intense value-pair-based matching algorithms.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Recommended Reading:

"Top 10 Data and Analytics Technology Trends That Will Change Your Business"

"Augmented Analytics Is the Future of Analytics"

"Top 10 Trends in Data and Analytics, 2020"

"Augmented Data Catalogs: Now an Enterprise Must-Have for Data and Analytics Leaders"

"Modern Data and Analytics Requirements Demand a Convergence of Data Management Capabilities"

Analytics Stewardship

Analysis by: Andrew White; Kurt Schlegel

Definition: Analytics stewardship is the process of enforcing and interpreting analytics governance policies. Analytics stewardship is focused on analytics content: where, how, and who can use/leverage analytics and insight. It is typically implemented in support of analytics, BI and data science solutions.

Position and Adoption Speed Justification: Organizations struggle to ensure that analytics and insight are developed by those with the right credentials; and that the resulting analysis is only shared or used by others also with the right credentials. There are more places across the

organization where analytics, BI and data science work takes place; and more solutions on offer to facilitate the same. In other words, the exposure to risk are greater and the challenges with mitigating that risks are more complex. So, while interest and demand in being able to analyze more data increases, the needs for assuring analytics policies are followed correctly in those departments and solutions is worse. Hype in this area is ramping up fast as organizations demand simpler solutions and vendors shift their efforts to meeting the growing demand. Analytical stewardship may exist as a discrete topic of interest for years to come, though long term it will be a capability executed in analytics, BI and data science solutions to comply with such policies. It may also be absorbed into emerging information stewardship solutions (shorter term) or data and analytics governance platforms (long term). For COVID-19 reset, organizations are making the need to enforce analytics policy even more pressing and urgent.

User Advice: The number of systems, solutions and places where analytics policies need to be enforced and executed has grown as the range and number of technologies have proliferated in the market. There are platforms, tools, applications. Some are focused on descriptive analytics and reporting; some and more so every day — on predictive and prescriptive analytics. Some are on-premises and are more in the cloud. All such systems have varying implementations of business rules, glossaries, catalogs, terms and generally metadata. As a result, it is no wonder that organizations struggle with a simple approach. Finally the driver here is often confused between what the business needs (the work of setting policy, or analytics governance) and what tools and IT can do (execute and follow policy).

Before the analytics policy can be stewarded or enforced, they need to be set. This is not a gratifying place of work for software vendors so it is left to consultants and manual efforts by business and IT leaders. But once those policies are set, they are instantiated in software as business rules and those rules need to be followed, monitored and enforced: Hence the hype around analytics stewardship. In time, the hype and focus may shift upstream to policy setting and analysis but not yet. The focus on analytics as something to govern and steward is analogous to data governance and stewardship thus the two — data and analytics — ought to connect — but only a few organizations see this far down the line.

Specific recommendations:

- Recognize the work of policy setting (who in the business sets policy); policy enforcement (who and where in the organization such policies are enforced and interpreted) and policy execution (where the rules are processed, typically in systems).

- Extend or connect your data governance work with needed analytics governance so that the policy setting and enforcement efforts can be aligned — this will reduce redundancy and save money, and lead to improved outcomes

- References are very useful in markets that are new or forming — use these to help qualify candidate vendors/solutions

- Don't assume your analytics, business intelligence, data science or artificial intelligence solutions support your requirements for analytics stewardship At most they might respect the

odd rule and follow it. You may need to build your own capability outside of those solutions. until the vendors wake up and build what you need.

Business Impact: Failures of analytics stewardship 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, through to even legal violations of access to private or confidential information and misuse. Investments in solutions to help with the task of enforcing and executing analytics governance policy may lead to additional investments beyond those you have for data and analytics governance and analytics, BI and data science. 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: Emerging

Sample Vendors: Alation; Collibra; ZenOptics

Recommended Reading:

"Data and Analytics Leaders Must Use Adaptive Governance to Succeed in Digital Business"

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

Responsible AI

Analysis by: Svetlana Sicular

Definition: Responsible AI is an umbrella term for many aspects of making the right business and ethical choices when adopting AI that organizations often address independently. These include business and societal value, risk, trust, transparency, fairness, bias mitigation, explainability, accountability, safety, privacy and regulatory compliance. Responsible AI operationalizes an organizational responsibility and practices that ensure positive and accountable AI development and exploitation.

Position and Adoption Speed Justification: Responsible AI signifies the move from declarations and principles to operationalization of AI accountability at the individual, organizational and societal levels. While AI governance is practiced by designated groups, responsible AI applies to everyone who is involved in the AI process. Organizations are increasing their AI maturity, which requires defined methods and roles that operationalize AI principles. Lately, responsible AI has been elevated to the highest organization levels by Accenture, Google, Microsoft, OpenAI, PwC, Government of Canada, Government of India, the World Economic Forum (WEF) and more. Although responsible AI is nascent in industries, pioneers include AXA, Bank of America, State Farm, Telefónica and Telus.

COVID-19 pandemic stressed the need for responsible AI, when all governments and the entire world were following AI models of pandemic projections and economies' reopening. Many AI

vendors and individual data scientists immediately shifted to solving pandemic problems, where they had to balance vital deliverables and risks associated with privacy, ethics, abrupt data changes and unconfirmed facts. Using AI for virus tracking, monitoring masks distribution and social distancing are subjects of public debate regarding appropriate AI interpretation, transparent data handling and clear exit plans for such temporary measures (see "How to Use AI to Fight COVID-19 and Beyond").

User Advice: Data and analytics leaders, take responsibility — it's not AI, it's you who are liable for the results and impacts, either intended or unintended. Extend existing mechanisms, like data and analytics governance and risk management to AI to:

- Establish and refine processes for handling AI-related business decisions.

- Designate, for each use case, a champion accountable for the responsible development of AI.

- Establish processes for AI review and validation. Have everyone in the process defend their decisions in front of their peers and validators.

- Provide guidelines to assess how much risk is appropriate.

- Ensure that humans are in the loop to mitigate AI deficiencies.

Build bridges to those organizational functions that are vital to AI success, but poorly educated about AI value and dangers to:

- Open a conversation with security, legal and customer experience functions.

- Build an AI oversight committee of independent, respected people.

- Continuously raise awareness of AI differences from the familiar concepts. Provide training and education on responsible AI, first to most critical personnel, and then to your entire AI audience.

- Have an escalation procedure early on in case something goes wrong.

- Anticipate human problems with AI: Identify enthusiasts who can help establish ongoing education about responsible AI.

The biggest problem in AI adoption currently is mistrust in AI solutions and low confidence in AI's positive impact. Responsible AI helps organizations go beyond purely technical AI progress to more successfully balance risk and value. With AI maturity, you will learn a lot and will make fewer mistakes — remain humble and keep learning.

Business Impact: Societal impacts of AI are frequently depicted in a distorted way, either too optimistically or as doom and gloom, while the responsible AI approach helps get a realistic view and instills trust. AI, like no other technology, encompasses organizational and societal dangers that have to be mitigated by responsible AI development and handling.

- The way AI is developed will encompass the mandatory awareness and actions regarding all aspects of responsible AI. Gartner predicts, "By 2023, all personnel hired for AI development and training work will have to demonstrate expertise in responsible development of AI."

- New roles, from an independent AI validator to chief responsible AI officer are necessary and are already being created to operationalize responsible AI at the organizational and societal levels.

- Responsible AI paves the way for new business models for creation of products, services or channels. It forms new ways of doing business that will result in significant shifts in market or industry dynamics via confirmed responsible AI actions and protocols; for example, a cross-organizational effort to fight "deep fakes."

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Recommended Reading:

"Predicts 2020: AI and the Future of Work"

"AI Ethics: Use 5 Common Guidelines as Your Starting Point"

"Data Ethics and COVID-19: Making the Right Decisions for Data Collection, Use and Sharing"

"Top 10 Strategic Technology Trends for 2020: A Gartner Trend Insight Report"

AI Governance

Analysis by: Svetlana Sicular

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 techniques. 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: 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. Leading organizations in the industries establish AI governance by addressing standards for AI development and operations, providing best practices, guidelines for model management and monitoring, data labelling and interpretation, AI value assurance and model risk management. The COVID-19 pandemic abruptly invalidated many patterns routinely detected by AI solutions, because pre-pandemic data stopped reflecting reality. This drew attention in organizations to advancing their AI governance to be able to restore and systemically assure stability and reliability of AI solutions.

User Advice: To develop AI governance, data and analytics leaders, CIOs and CDOs should apply the framework of trust, transparency and diversity and to data, algorithms and people 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 guidelines for "life-critical AI" that encompasses physical or moral safety.

- Identify transparency requirements for data sources and algorithms. Promote transparency and explainability of AI-enabled decision-making to minimize misinterpretations 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 accountability for implementing each AI use case — all use cases differ in terms of their data, solution and outcomes requirements. Ensure ethics is considered for each use case. 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 the common ground across the entire organization when it comes to:

- Ethical and safety principles, together with mechanisms to ensure their development and adherence.

- Trust and transparency mechanisms to reach a common understanding of data and algorithms that are used for AI via model governance and collaboration norms and capabilities.

- 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.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Recommended Reading:

"AI Governance Spotlight: Early Lessons and Next Practices"

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

"Governance and Best Practices for Chatbot Development"

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

"Artificial Intelligence Primer for 2020"

"Cool Vendors in Enterprise AI Governance and Ethical Response"

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 ramping up, driven today in the COVID-19 reset. Organizations have lost the ability to rely on managed historical data and are urgently amassing or seeking access to more immediate data to understand the world around them. As such trust in usable, data is now in very short supply; it cannot be assumed, needs to be evaluated, and is hard to earn. Thankfully new technologies like ML-augmented knowledge graphs are helping discover relationships in data so that trust can be established more quickly or more effectively. The hype is augmented via analytics, machine learning and AI space, where machine learning models are being retrained on that new data being gathered. Trust-based models often can help alleviate the demands put on data, and people, with traditional methods for data quality and data and analytics governance, that seek black and white definitions and degrees of context.

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 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"

"7 Must-Have Foundations for Modern Data and Analytics Governance"

Data Literacy

Analysis by: 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 business value or outcome.

Position and Adoption Speed Justification: Data literacy capability is a significant aspect of broader data and analytics maturity, and a core enabler of digital business. Businesses are not "data driven" with respect to decision making and value creation because the workforce do not "speak data" consistently.

Awareness and interest in data literacy are accelerating, with a growing number of commercial and educational organizations investigating, planning and delivering specific data literacy programs. However, for the past three years, respondents to Gartner's Chief Data Officer Survey have ranked "poor data literacy" among the top three internal roadblocks to success. Currently, obstacles to more rapid and widespread adoption include relatively few common data literacy models/ frameworks or industry standards, an absence of comprehensive data literacy programs and a piecemeal approach to training and certification.

Providers of data literacy service offerings are emerging to meet the rising demand. However, "data literacy" can mean different things to different providers, from enhanced data visualization skills to fostering curiosity about data more broadly. Consulting services, providers of self-service analytics

and citizen data scientist software tools, and boutique firms will address the demand within the next 18 months. Universities are also expanding relevant courses to fill the talent gap and ready the next generation of workers with these essential life skills. The general rate of adoption may still be measured in years, however.

User Advice: Data and analytics leaders including chief data officers (CDOs) should begin with data literacy programs and workshops. These should include examples of the use of data storytelling and decision models to convert conversations into measurable business outcomes and value.

Pilot a mix of the following to get started:

- Raise awareness though storytelling. Start with a high-level awareness campaign to showcase the importance, meaning and value of data and analytics across the organization — from workers who don't realize they are information workers, to executives who cherry-pick data in support of decisions already made.

- Call out examples of "good" and "bad" data literacy to promote desired behaviors. Leverage humor and nonbusiness analogies to create a sense of inclusion and to demystify data literacy.

- Pilot a data literacy skills program. Work with a group of stakeholders who already have enthusiasm and appetite for data and analytics and who recognize that improving data literacy is a necessary factor for success. Ideally, bring together cross-functional and multifunctional groups that share a common business outcome. These become your evangelists as you expand the program.

- Collaborate with HR and line-of-business leaders to assess data literacy skills and training requirements, design upskilling roadmaps, create curriculum and determine training performance metrics.

- Use data literacy assessments to factor in people's current data literacy levels, competencies and desire to participate when inducting them onto the training. Contextualize training programs and embed on-the-job learning experiences based on users' change readiness and capabilities.

- Monitor the results of improved data literacy within the workforce by using data literacy assessments and by measuring associated improvements to data-driven business outcomes.

- Work with third-party providers to plan data literacy programs that include deliberate training, coaching and awareness for data literacy skills across the workforce. Partner with your selected third parties to tailor such programs to suit specific line-of-business functions and roles (for example, marketing, sales, finance, frontline staff).

Services firms and software providers 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 and analytics. 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. Data literacy will impact all employees, from the boardroom 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 when developing solutions.

- 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.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Avado; Collibra; Data to the People; Gartner Consulting; Pluralsight; Qlik; Skillsoft; Tableau; The Data Lodge; Tuva

Recommended Reading:

"How Chief Data Officers Show Leadership in Improving Data Literacy and Fostering a Data-Driven Culture"

"Tool: Communicating the Need for Data Literacy Improvement"

"Data Literacy Providers Will Accelerate the Time to Value for Data-Driven Enterprises"

"Toolkit: Data Literacy Individual Assessment"

"Toolkit: Data Literacy Organizational Assessment"

"Toolkit: Curriculum for Data Literacy Training Programs"

At the Peak

Augmented Data Quality

Analysis by: Melody Chien; Ankush Jain

Definition: Augmented data quality refers to the application of AI/ML across data quality (DQ) products (e.g., profiling, matching, linking, merging, cleansing, monitoring and issue resolution) offered by vendors in their data quality solutions. Augmented data quality extends conventional data quality features to reduce manual tasks with autorecommendations on "next best actions." Augmented DQ is also complemented by NLP to understand and translate business requirement into data quality rules based on business context and definition.

Position and Adoption Speed Justification: As organizations accelerate their digital transformation and innovation initiatives and take advantage of distributed environments with the huge number of data assets (internal and external) 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 DQ tools and practices is rapidly diminishing.

Vendors of DQ tools have recognized this and have responded by augmenting and extending their existing data quality capabilities with AI, machine learning and other advanced technologies. For the past several years, DQ vendors have been heavily investing in AI/ML to differentiate themselves in the market. There are many data quality tasks that have been automated with ML technology, such as data matching, data transformation and enrichment, and business rule suggestions. During the COVID-19 pandemic, some of mainstream DQ vendors demonstrated this augmented data quality capability. They responded by quickly integrating, transforming and standardizing huge volumes of data from various sources in various data types and formats (structured or unstructured) for outbreak detection and contact tracing. The market shows fast adoption of this technology, especially in public health and healthcare industries.

As these underlying technologies (AI/ML, NLP, graphic analytics, predictive analytics) mature over time and become more widely adopted, we are expecting to see a broadening out of this support to the entire spectrum of data quality tasks, for greater productivity and higher efficiency. As augmented data quality continues to expend and develop, it is possible that end users will see some occurrences of functionality conflict, as providers in adjacent markets (e.g., metadata management, and master data 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 the immediate future.

User Advice: Organizations faced with challenges of time-consuming and manually intensive DQ processes should first assess the existing augmented DQ capabilities within their data quality solution, 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 complex business logic and workflow, and large, distributed and fast datasets (e.g., streamed data) must be understood. Then, opportunities to close this gap by leveraging the augmented DQ functionality, where it exists, must be explored. Work with vendors to explore their augmented data quality 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 tool provider does not provide augmented DQ components within their offering. In such cases, if the opportunity cost of not having 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, seek to exploit new markets or improve customer experiences, the complexity of their 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. In addition, growing regulatory requirements, from government and from industry, add more restriction to organizations in how to manage personal data properly. Organizations now are accountable for any personal data they are holding. So, how to incorporate regulatory requirement into the architecture of their products and services in order to comply is a big challenge. Many existing DQ tools that lack the ML-enabled features present difficulty in managing data privacy and compliance requirements at scale. Therefore, organizations that are quick to exploit augmented data quality features are likely to have a greater competitive advantage with greater automation and further insights. However, because the risk associated 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: 5% to 20% of target audience

Maturity: Adolescent

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

Recommended Reading:

"Magic Quadrant for Data Quality Tools"

"Critical Capabilities for Data Quality Tools"

"Build a Data Quality Operating Model to Drive Data Quality Assurance"

"Predicts 2020: Data Management Solutions"

"Modern Data and Analytics Requirements Demand a Convergence of Data Management Capabilities"

Digital Ethics

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

Definition: Digital ethics comprise the systems of values and moral principles for the conduct of electronic interactions among people, organizations and things.

Position and Adoption Speed Justification: Digital ethics remains at the Peak of Inflated Expectations. Digital ethics and privacy remain growing concerns for individuals, organizations and governments. Consumers are increasingly aware that their personal information is valuable, and they're frustrated by lack of transparency and continuing misuses and breaches. Organizations increasingly recognize the risks involved in securing and managing personal data, and governments are implementing strict legislation in this area.

The coronavirus outbreak has demonstrated the important role of digital ethics in how governments and healthcare organizations are using technology and personal data to address the pandemic. However, no matter how urgent the response to the crisis is, decisions about how technology and data are used could result in more harm than good if those decisions are not grounded in digital ethics. The pandemic has shown that regardless of the hype around digital ethics, many organizations are still not applying them. And, as a result, the innovation hasn't yet passed the Peak of Inflated Expectations.

Board members and other executives are sharing their concerns about the unintended consequences that the innovative use of technology can have. There is frequent, high-profile press coverage of stories that concern the impact of data and technology on business and society more broadly. More universities across the globe are adding digital ethics courses including the University of Oxford and the University Melbourne that recently launched programs and centers to address ethical, policy and legal challenges posed by new technologies. Government commissions and industry consortiums are actively developing guidelines for ethical use of AI. See "How Forthcoming EU Legal Framework Will Affect Your AI Initiatives."

User Advice: Business value and digital ethics need not be in conflict. Intention is key. If the only goal is business performance, and ethics is seen only as a way of achieving this goal, this may lead to window dressing. However, if the goal is to be an ethical company, and this leads to better business performance, then this serves all parties, and society more broadly. It will only strengthen the organization, helping you to have an even greater positive influence in the future.

Business and IT leaders responsible for digital transformation in their organizations should:

- Identify specific digital ethics issues, and opportunities to turn awareness into action throughout the various business domains.

- Discuss ethical dilemmas from different points of moral reasoning, such as outcome determinative versus empathy-focused. Ensure that the ethical consequences have been accounted for and that you are comfortable defending the use of that technology, including unintended negative outcomes.

- Elevate the conversation by focusing on digital ethics as a source of business value, rather than simply focusing on compliance and risk. Link digital ethics to concrete business performance metrics.

Business Impact: There are ethical consequences that arise through the use of digital technology in every business domain. Digital ethics should be treated as a tangible business practice discipline rather than an academic discussion. It does not have to be at odds with optimizing business performance. In fact, ethical behavior can have business value in itself.

Areas of business impact include influencing innovation ideas, product development, customer engagement, corporate strategy and go-to-market.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Avanade; Hypergiant; IBM; Microsoft; Salesforce; SAP; SAS

Recommended Reading:

"Data Ethics and COVID-19: Making the Right Decisions for Data Collection, Use and Sharing"

"Digital Ethics: What Every Executive Leader Should Know"

"Digital Ethics by Design: A Framework for Better Digital Business"

"Top 10 Strategic Technology Trends for 2020"

"The CIO's Guide to Digital Ethics: Leading Your Enterprise in a Digital Society"

"Data Ethics Enables Business Value"

"Use Privacy to Build Trust and Personalize Customer Experiences"

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: 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.

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.

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 and claims adjudication) 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. These include 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: CDQ; SAP; Winshuttle

Recommended Reading:

"Eight Ways Ecosystems Supercharge Business Models"

"How to Select the Best Platform Business Model"

"5 Digital Ecosystem Types That Will Impact Every Enterprise"

Data Hub Strategy

Analysis by: Ted Friedman; Andrew White

Definition: A data hub strategy effectively determines where, when and how data needs to be mediated and shared in the enterprise. It layers data and analytics governance requirements atop data sharing demands to establish the technology approach for enabling data flow. The strategy drives implementation of one or more data hubs that link the work of data and analytics governance and sharing. Deployment of data hubs involves various types of integration technology, governance-related tools, metadata and, possibly, data persistence capabilities.

Position and Adoption Speed Justification: 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). Examples of common data hubs today are master data management solutions (master data hubs) and data integration hubs. Endpoints, such as business applications, data warehouses or data lakes, interact with the data hub(s), provisioning data into it or receiving data from it. The hub then 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 applying these principles (perhaps without the name "data hub"), the hype is really not relevant. The hype related to data hubs has reached a peak — technology providers and practitioners of various types have a focus on this topic, but often with very different definitions, principles and goals. This is due to several reasons:

- The opportunity created from the general failure of modern data and analytics efforts to cope with high complexity across large and diverse landscapes of data, applications and processes.

- The misinformation created by vendors that sell capabilities referred to as "data hubs" or "hubs" that have little to do with this modern design pattern.

- The confusion created internally when enterprises don't clearly understand and communicate the definition and purpose of data hubs.

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 data and analytics teams get this point, the idea makes a lot of sense. However, vendor messaging will continue to confuse many organizations.

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

- In your architectures and business plans, consider all applications, databases, data warehouses and data lakes as possible endpoints. The purpose of a data hub strategy is to focus on key

points where you can gain benefits by applying data and analytics governance more effectively across sets of endpoints that need to share data.

- Design a data hub strategy to understand data and analytics governance and sharing requirements, and to drive integration efforts.

- Include any master data, application data, reference data, analytics data hubs or other intermediaries such as customer data platforms, in your overall data hub strategy.

- 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 platforms (CDPs) and general-purpose integration hubs. 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 endpoints are connected to data hubs, and possibly 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 there are no effective data and analytics governance, data sharing or effective integration programs in place, the benefits of starting with a data hub strategy (compared with trying to retrospectively fit one into an established environment) will be greater.

Benefit Rating: High

Market Penetration: 5% to 20% 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"

"Data Hubs: Understanding the Types, Characteristics and Use Cases"

Data Catalog

Analysis by: Guido De Simoni; Ehtisham Zaidi; Robert Thanaraj

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 architect, developers, 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 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 concern of introducing metadata silos due to these embedded data catalogs in broader solutions. Customers are 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 capabilities, data is catalogued to achieve a business outcome. Which usually means faster data quality, faster data integration, more informed analytics, support for data stewardship, enhanced productivity, improved productivity of data lake initiatives and more recently better cloud migrations. 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 long 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 but moving in the Hype Cycle in alignment to the expansion of markets and use cases requiring the capability.

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 analysts. This is particularly true with the increasing need to incorporate and correlate exogenous datasets in support of innovative use cases driven by digital business and 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 and leverage catalog capabilities in existing data management tools before investing in external tools.

- 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 (like those delivered as part of a Hadoop distribution, a cloud-based data lake, etc.) will improve data usability, trust and shareability only in the context of that 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 interfaces for 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 for example data lake and/or graph database 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; Collibra; IBM; Informatica

Recommended Reading:

"Augmented Data Catalogs: Now an Enterprise Must-Have for Data and Analytics Leaders"

"Modern Data and Analytics Requirements Demand a Convergence of Data Management Capabilities"

"Magic Quadrant for Metadata Management Solutions"

Cloud MDM

Analysis by: Sally Parker; Simon Walker

Definition: Cloud MDM solutions are master data management (MDM) solutions available in the cloud, 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: While the software market has largely shifted to cloud deployment models over the last decade, MDM has been slow to follow. In the past, MDM vendors delayed offering cloud-based solutions due to the ongoing reluctance of end-user organizations to embrace cloud for their most critical data — their master data.

In 2019, Gartner saw a tipping point in favor of cloud-based MDM deployments among end-user organizations, driven by four key themes:

- Broader acceptance of, and trust in, cloud

- The gravitational pull of the organizations' application and data ecosystems that have already migrated to cloud

- Cloud providing a lower barrier to entry to MDM

- Increased availability of cloud-based MDM offerings

This adoption is expected to accelerate over the next two to five years as interest in MDM expands to a previously untapped and broader client base favoring a lower barrier to entry. Gartner has seen a spike in inquiries regarding MDM, and renewed interest in cloud as a result of COVID-19. In parallel, MDM vendors are well-progressed in transitioning their solutions from perpetual to subscription-based licenses and from on-premises to cloud-based solutions. The latter will ultimately "pull" the market to cloud as vendors favor new feature rollout and support for cloud-based platforms to streamline their own product management cycles.

User Advice: Cloud is a viable option for the very reasons organizations have migrated other software to cloud — scalability, flexibility and opex funding models. Cloud provides an attractive option for organizations where in-house MDM skills are lacking — SaaS solutions providing the lowest-touch option, and PaaS/IaaS for those with some in-house skills requiring additional levels of configuration flexibility. Monitor the maturity of cloud-based MDM solutions and their suitability to support your required MDM use cases, implementation styles and data models as the market continues to evolve. Evaluate any gaps in capability between candidate vendors' cloud-based and on-premises MDM solutions, to determine when and whether a migration between the cloud and on-premises environments is viable. Cost should not be the driver for cloud MDM and due diligence is required around capacity planning and total cost of ownership (TCO) modeling. Organizations should anticipate more complex governance and data integration. Conduct a thorough review of current governance practices as a precursor to cloud readiness. Map and actively track the center of data gravity within your organization for each master data domain, to identify prospective "tipping points" for cloud. Review and document integration complexity to provide a manageable integration scenario that does not negate any benefits of cloud-based MDM.

Business Impact: Cloud-based MDM solutions offer organizations access to new funding models, deployment flexibility and improved time to value. These services also help organizations with insufficient MDM knowledge, providing them with experience and resources required to deploy and maintain on-premises MDM solutions. However, without appropriate capacity planning and cost modeling, cloud services may prove more expensive on a TCO basis.

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. Hence, 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: 5% to 20% of target audience

Maturity: Adolescent

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

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"

Sliding Into the Trough

360-Degree View

Analysis by: Simon Walker

Definition: A 360-degree view brings together selected data about a customer, product or other business-critical objects 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: Confusion in the market on how to approach this is a direct result of overlap in features and functionality between different technologies and approaches. The hype for 360-degree view has stalled because of growing confusion from competing technologies such as application data management (ADM), customer data platforms (CDP) and

master data management (MDM), in addition to solution-focused tools for data stewardship and data quality. These differ in complexity, cost, impact and reward. The confusion is heightened as the level of interest in 360-degree extends to nontechnologists. MDM, when designed and implemented effectively, offers the biggest reward, but requires the biggest effort. Gartner recommends that data and analytics leaders work with stakeholders to ensure the foundations for success are established. It may help to recognize:

- MDM is effectively rightsized when the scope of master data involved is the least amount of data most widely shared across the most important business processes, decisions and systems/apps.

- ADM is effectively rightsized when the scope of the application data is tied to a specific application or integrated suite, and that data is not shared or reused outside of that application or suite.

- 360-degree solutions are most effective when master data, application data and other rich data specific to a channel (e.g., customer, product), is aggregated even if that data is governed and/or mastered in other systems such as MDM or ADM.

User Advice: A 360-degree view can only be achieved with a foundation of trusted high-quality master data at its core. 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. Example analytical approaches to creating a 360-degree view include data lakes, enterprise data warehouse, contextual MDM, or a logical data warehouse.

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 enabled holistically through many business contexts.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Adobe; IBM; Informatica; Reltio; Salesforce; Semarchy

Recommended Reading:

"Choose Between Customer Data Platforms and MDM Solutions for 360-Degree Customer Insights"

"Evolve From Product Information Management to Product Experience Management With a 360-Degree Analytics Strategy"

"MDM Is Critical to Maximizing CRM and Customer Experience"

Data and Analytics Governance

Analysis by: Saul Judah; Andrew White; Debra Logan

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 disposition 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: The outbreak of COVID-19 has led data and analytics leaders to focus their attention and effort on data and analytics for mission-critical operations. Therefore, the extent to which data and analytics have invested in improving their governance practices and expanding its scope within their enterprise has been very limited. Though there is much hype in this area, its progress on the Hype Cycle has slowed. However, once recovery begins, we expect to see organizations increasing attention on improving their data and analytics governance capability.

COVID-19 aside, we have seen growing hype and interest in AI model governance, analytics governance in data warehouses/lakes, trust-based governance, IoT data governance and ethics as a discrete policy. In addition to this, organizations are slowly beginning to recognize the need for a contiguous approach to governance, rather than taking their current silo-based (e.g., data governance, analytics governance) approach. Furthermore, organizations that are more mature in data and analytics show continuing interest in taking a more unified approach beyond just data and analytics governance, and are exploring unified governance, spanning quality, privacy, security and others. However, the scope of data and analytics governance remains all data and analytics: application data, content, records, external social data, master data, metadata, algorithms and AI models, analytics models, and KPIs or metrics.

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 wrongly equate governance with compliance. As a result, too few initiatives are outcome-driven. Aim to govern the least amount of information, with the least amount of effort that results in maximum business impact, paying close attention to managing your risk. Rather than taking a one-size-fits-all approach, use adaptive data and analytics governance to apply different governance styles to your different business scenarios.

Data and analytics leaders should take the following steps:

- Identify critical business outcomes that need good data and analytics to be successful. Focus your data and analytics governance work on this, developing a business case if needed.

- Actively engage key business stakeholders in sponsoring and driving the initiative, alongside the chief data officer (CDO).

- Focus on the "least amount of data with the maximum business impact," to embed the work of D&A governance in the business context.

- Clearly define the scope of 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, consider how data standards and metadata management can be used to implement data and analytics governance in the enterprise. Though business leaders may not fully understand their importance, an industrial governance capability needs enterprise-scale data and analytics capabilities.

Business Impact: Since most business goals rely on good data and analytics to be achieved, effective data and analytics governance is critical to the organization. Successful implementation of data and analytics governance will allow organizations to balance the strategic needs for data and analytics with the needs of business-area leaders. At the enterprise level, strategic goals require consistent data and analytics governance across multiple organizational and interenterprise silos. At the business-area level, it should act in a consultative manner, encouraging innovation, facilitating and supporting the governance needs of business leaders in their organizational areas.

Data and analytics governance can extend across all aspects of the data and analytics ecosystem, 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, master data, metadata, etc.

Starting with business outcomes leads to a more direct connection with the instruments of governance (e.g., policies, standards) leading to identification of the right data and analytics metrics to enable those outcomes.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Recommended Reading:

"7 Must-Have Foundations for Modern Data and Analytics Governance"

"Use Gartner's Value Pyramid to Connect Data and Analytics to Business Value"

"Reset Your Information Governance Approach by Moving From Truth to Trust"

"Data and Analytics Leaders Must Use Adaptive Governance to Succeed in Digital Business"

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 business objectives. The three types of digital twins are discrete, composite and organizational. Digital twin class elements include the model, rules, relations and data properties. Digital twin instance elements include the model, data, unique one-to-one association, and monitorability.

Position and Adoption Speed Justification: The idea of modelling people, physical assets, and processes continues to gain traction, especially as the architecture for the future of applications includes digital twins as features of an application, and as stand-alone supplements to portfolios of applications that address an entity.

- **People:** Digital twins are the evolution of trends including customer 360-degrees, patient electronic health records, and fitness monitors. Their near-term uses include health monitoring and employee safety, particularly in response to the pandemic.

- **Physical assets:** Digital twins adoption aligns to Internet of Things (IoT) trends. For owner/ operators, near-term use includes lowering maintenance costs and increasing asset uptime for equipment users in factories, hospitals, utilities, etc. For product original equipment manufacturers (OEMs), near-term uses include product differentiation, business model differentiation through new product service models, and obtaining customer data.

- **Processes:** Digital twins are being developed to model IT organizations, financial exchanges, and processes such as purchase orders.

The digital twin profile has moved past the Peak of Inflated Expectations, based on enterprise confusion driven by conflicting vendor marketing and on challenges implementing digital twins. Gartner's CIO Survey 2020 shows that 6% of enterprises have implemented digital twins, although less than 1% of assets have digital twins. Another 41% of enterprises expect to deploy digital twins within three years. These trends lead us to shorten the time to plateau down to two to five years. In the next decade, digital twins will become the dominant design pattern for digital solutions.

User Advice: CIOs should work to guide and protect business adoption of digital twins:

- **Business outcomes:** Work with business leaders to establish clear business objectives for digital twins. In parallel, establish an IT vision for digital twins, to establish a coherent approach to support the business units.

- **Technology:** Start with models that are as simple as possible of the entities that are of interest for your business process, whether basic, such as the location of vehicles or a very high fidelity models of a human heart. Determine what data is necessary to "feed" the models and the types of analytics needed; a corollary here is the need to verify and drive data quality. Don't let the dearth of standards limit innovation. Assess how composite and organizational digital twins will require integration and custom development.

- **Governance and accountability:** Engage the business unit to identify champions, budget support, and to co-build the digital twin strategy and roadmap. Establish a joint business and IT governance process for digital twins, covering their alignment to business KPIs, short and long term value, and their updates and 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. In parallel, establish a digital ethics policy to guide the organization to develop twins that positively support the enterprise while serving employees, customers or citizens. This policy will set guidelines to engage ecosystem stakeholders about what data may be shared and what monetization experiments to conduct.

- **Vendors selection:** Understand most technology providers are still developing their strategy and mostly offer enabling technology. A small number of technology providers have digital twin portfolios which align with specific vertical markets.

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 its value centers on remaining a live model, synchronized with the entity.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: AVEVA; Bentley Systems; C3.ai; Cognite; GE Digital; Mavim; Microsoft; QPR Software; Schneider Electric; ThoughtWire

Recommended Reading:

"Market Guide for Digital Twin Portfolios and Enabling Technologies"

"Survey Analysis: IoT Digital Twin Adoption Proliferates Across Many Sourcing Options"

"Toolkit: Enterprise Readiness for Digital Twin Deployment"

"Market Trends: Software Providers Ramp Up to Serve the Emerging Digital Twin Market"

"Software Product Managers Should Exploit the Full Revenue Potential of Digital Twins"

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 several 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. 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). Even more so with the potential convergence of capabilities in the context of data and analytics governance; hence, information stewardship applications are in a state of stall on the Hype Cycle.

User Advice: COVID-19 is pushing all organizations to address understanding of curated data in a more operationalized and automated way. Data and analytics leaders should work with their technology providers to help them understand what works for information stewardship that 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.

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 example, for new product introductions), 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: ASG Technologies; Collibra; Global IDs; Infogix; Informatica; Prodago; 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 are software that includes 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 and its role in the information architecture in support of four use cases: data governance, security and risk, analytics and data value.

Position and Adoption Speed Justification: Metadata management solutions (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 much broader metadata capabilities than catalogs and address all use cases, thus relieving the current issues emerging from metadata silos. As a result, MMSs are accelerating due to innovation generated by active metadata that leverages machine learning. Active metadata enables real-time analysis of the applicability of data, checks on the veracity of data sources used, and monitoring of the ways users act as they form dynamic communities that support outcomes from positive "tribal" behaviors while simultaneously avoiding exclusivity. In this case, we refer to how informal and formal teams emerge and slowly convert to community participation with as much automation as possible to ease and simplify this process. These demands are only now starting to be addressed by vendors, with modern metadata management practices slowly being established within organizations.

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, data quality and even master data capabilities, before buying a modern MMS. However, if dealing with emerging use cases, including data and analytics governance, security and risk, support for analytics and augmented data value, they should learn about, and build pilot implementation using MMSs. In addition, the introduction of "active metadata" concepts (to metadata in 2019, but prior to that for integration in 2017) means that some of the more basic catalog capabilities no longer differentiate solutions in the market. Data and analytics leaders must now consider using metadata from platforms, tools, third-party providers and a widely divergent range of data sources and user experiences.

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: Alation; Alex Solutions; ASG; Collibra; erwin; IBM; Infogix; Informatica; Oracle; SAP

Recommended Reading:

"Magic Quadrant for Metadata Management Solutions"

"Critical Capabilities for Metadata Management Solutions"

Application Data Management

Analysis by: Andrew White; Malcolm Hawker

Definition: Application data management (ADM) is a technology-enabled discipline where business and IT work together to ensure uniformity, accuracy, stewardship, governance, semantic consistency and accountability for data in business application or suite, such as ERP, customer data platform, or custom-made app. Application data is the consistent and uniform set of identifiers and extended attributes used within an application or suite for things like customers, products, or prices.

Position and Adoption Speed Justification: Organizations 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. The focus has shifted recently to data quality and entity resolution as newer uses of graph technology, even augmented with machine learning, to improve the speed and efficacy of entity discovery and identification. As a result this innovation profile has moved back up the down-swing of the Hype Cycle being drawn by growing hype in related technologies such as graph.

With the COVID-19 reset, we anticipate a balancing of price power between rightsized MDM and ADM implementations. Organizations will realize they are different value propositions, business value, and you don't always need both at the same time.

User Advice: Starting with a focus on business outcomes to identify what data matters most, organize, classify and govern data based on which drives the most important business outcomes:

- **Master data and MDM —** The data that matters most to the most impactful business outcomes. Master data is the least number of attributes that define business entities such as customer, citizens, products, services etc., are governed in a master data hub for the broadest use across all applications and uses and are thus context-free

- **Application data and ADM —** The data that matters most to a specific set of use cases supported by one application or suite like e-commerce or customer data platform. Application data is the rest of the descriptive or reference data that describes business entities and other entities such as price, unit of measure, etc. used in an application or suite for uses specific to those applications or suites and are thus context-specific.

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 marketers, 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: Chain-Sys; Epicor Software; Oracle; PiLog; SAP; Tealium; Utopia Group; Winshuttle (EnterWorks)

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 the 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 support 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 aid 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"

"Toolkit: RFP Template for Master Data Management Solutions"

Information Stewardship

Analysis by: Guido De Simoni; Andrew White

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 in this context includes data, analytics, algorithms, documents, images, metadata — effectively, 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 (though still limited) acceptance of information stewardship. Despite the wider acceptance of information stewardship needs, many organizations have relied on the often reactive and heroic efforts of "citizen stewards" to solve data problems holding outcomes and decisions back. Organizations are not yet, "en masse," ready to invest the necessary time and money on the right solutions or training of their business users to deliver an operational function for stewardship. In the recent past, we have seen organizations

maturing in this area still trying to shape information stewardship (even within business areas) by testing and validating the approach before committing to an established discipline. This has been largely affected by the lack of maturity in the overall discipline of data and analytics governance. COVID-19 is pushing governance to be a key element of innovation under the umbrella of adaptive governance and this might bring a new focus on information stewardship in 2021.

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 as 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 they are consistent with the desired business outcomes. IT can execute the instructions and results of stewardship (e.g., data maintenance or policy execution).

Users are advised:

- To leverage information stewards from within the business — they have the required acumen, familiarity and context to be best placed to enforce policies

- To not outsource the work of policy enforcement, because of the lack of context and limited business domain knowledge of the outsourcing partners.

Organizations with established information stewardship practices should evaluate and implement modern technology that supports operationalization and automation leveraging ML/AI.

Business Impact: Poor-quality information leads to bad decisions, regulatory compliance failures, competitive disadvantages and a host of other problems. Gartner research demonstrates that most companies suffer from poor data quality — at least in some part of their organizations. 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 the perceived additional burden on business experts who have other primary functions. Enabling technology can make information stewardship less onerous, but where the "ask" is not clearly understood and potentially formalized, expecting people to become citizen stewards "in their spare time" will yield suboptimal and inconsistent behavior. Stewardship must be made an organizational and personal priority.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Recommended Reading:

"Design an Effective Information Governance Strategy"

"Toolkit: Data and Analytics Governance Role Descriptions"

Master Data Management

Analysis by: Sally Parker; Simon Walker

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 customers, citizens, suppliers, products, assets, sites, hierarchies and the chart of accounts.

Position and Adoption Speed Justification: MDM is focused on the consistency and quality of data that describes the core entities of an organization — data that sits at the heart of the most important business decisions. The need for consistency of this 'master data' across business silos and the recognition that MDM is the cornerstone of digital business success continues to drive interest in MDM. Organizations having invested in establishing an enterprisewide, trusted, view of their master data benefit from a greater agility to predict and respond to unexpected events — such as COVID-19 triggered changes in customer buying patterns. Interest in MDM has spiked courtesy of COVID-19.

The market penetration of MDM as a whole is still low due to perceived complexity and cost. Efforts are underway by MDM vendors to lower the barrier to entry to adoption with subscription pricing, cloud offerings, simpler products, and rapid deployment tools. However, MDM remains a complex and maturing undertaking because technology is often mistakenly seen as a panacea — technology alone is insufficient to solve a problem that traverses people, process and technology across the enterprise. Confusion also remains regarding what constitutes master data and discipline in keeping the MDM program lean when in the pursuit of a "360-degree view" of critical data.

MDM is leaving the Trough of Disillusionment as organizations better understand the challenges, but they still most often are unable to overcome them without 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. Business applications affected may include 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 an enabler of this strategy.

Companies investigating MDM should treat MDM as a technology enabled business initiative and consider the following:

- Secure executive sponsorship prior to proceeding.

- Ensure a clear "line of sight" to tangible business benefits.

- Prioritize, and agree upon which business initiatives will benefit most from trusted master data as a starting point.

- Stay lean and focused — classify only the most widely shared application data as master data "the least amount of data governance on the least amount of data that has the greatest impact on business outcomes."

- 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.

- Factor services into costs, over 90% of organizations leverage services for support with their MDM strategy and/or implementation.

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 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"

"Critical Capabilities for Master Data Management Solutions"

"Mastering Master Data Management"

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

MDM of Customer Data

Analysis by: Sally Parker; Malcolm Hawker

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 for example, customers, patients, and citizens). 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 interest and adoption increases. COVID-19 has prompted increased interest in MDM as organizations acknowledge the benefits of establishing an enterprisewide, trusted, view of their customer master data — greater agility to predict and respond to changes in customer buying patterns for example. 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 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 like patient/provider in healthcare and citizen in the public sector) that is fragmented across systems should implement MDM of customer data. They should use a style that integrates with established source systems and provides a system of record for customer master data. MDM of customer data programs typically focus on improving operational business processes but can also benefit downstream analytical environments.

A successful MDM of customer data program requires more than technology. It requires a business-driven vision and strategy that focuses on key business problems. It is important to pursue a long-term MDM vision above any downstream 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 multivector MDM implementation strategy, which adds capabilities to a 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 application-specific data governance requirements.

Evaluate solutions based on capabilities for data modeling and quality, integration, data stewardship and information governance, business services and workflow, measurement, and manageability. Ancillary technologies, such as enterprise service bus or an analytics platform, may also be required to accomplish your business goals. Be aware of well-hyped technologies in adjacent categories, like Customer Data Platforms (CDPs), which claim to offer customer MDM features, but often lack the capabilities Gartner expects from enterprise MDM platforms such as data quality, integration, stewardship and governance capabilities.

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. In times of uncertainty such as COVID-19 the benefit of a holistic and trusted view of customer on which to base business decisions is invaluable. 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"

"Critical Capabilities for Master Data Management Solutions"

"Choose Between Customer Data Platforms and MDM Solutions for 360-Degree Customer Insights"

"MDM Is Critical to Maximizing 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 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 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, it 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. These solutions 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.

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; IBM; Informatica; Riversand Technologies; SAP; Stibo Systems; TIBCO Software; Viamedici; Winshuttle
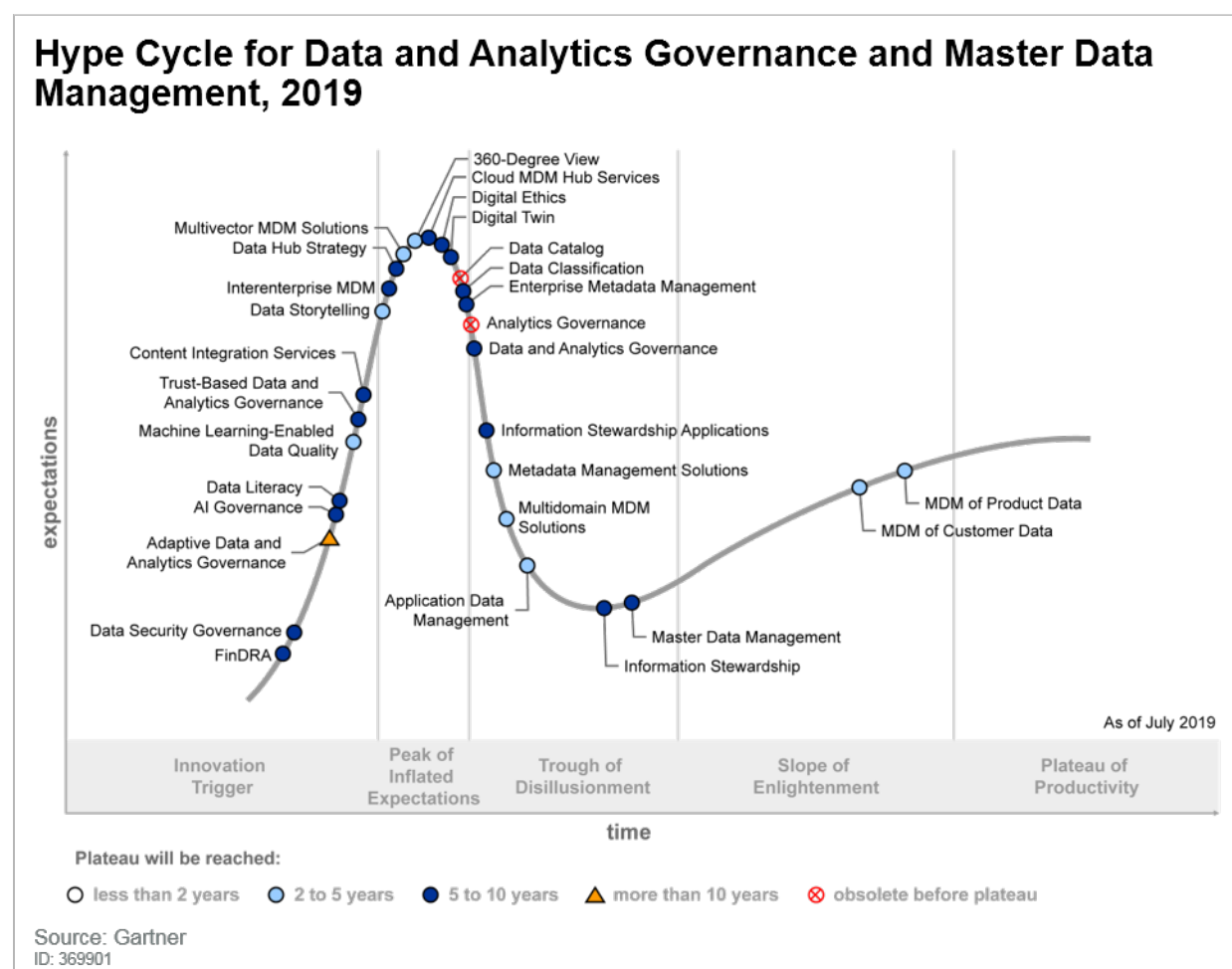
Recommended Reading:

"Magic Quadrant for Master Data Management Solutions"

"Critical Capabilities for Master Data Management Solutions"

"Think Big, Start Small, Be Prepared — Master Data Management"

Appendixes

Figure 3. Hype Cycle for Data and Analytics Governance and Master Data Management, 2019

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 1. Hype Cycle Phases

Phase	Definition
Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.
Peak of Inflated Expectations	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.
Trough of Disillusionment	Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	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.
Plateau of Productivity	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.
Years to Mainstream Adoption	The time required for the technology to reach the Plateau of Productivity.

Source: Gartner (July 2020)

Table 2. Benefit Ratings

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

Source: Gartner (July 2020)

Table 3. Maturity Levels

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

Source: Gartner (July 2020)

Gartner Recommended Reading

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

Understanding Gartner's Hype Cycles

7 Must-Have Foundations for Modern Data and Analytics Governance

Data and Analytics Leaders Must Use Adaptive Governance to Succeed in Digital Business

The Role of Technology in Data and Analytics Governance

The State of Data and Analytics Is Worse Than You Think

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

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

Choose Between Customer Data Platforms and MDM Solutions for 360-Degree Customer Insights

Market Guide for MDM External Service Providers

Evolve From Product Information Management to Product Experience Management With a 360-Degree Analytics Strategy

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