

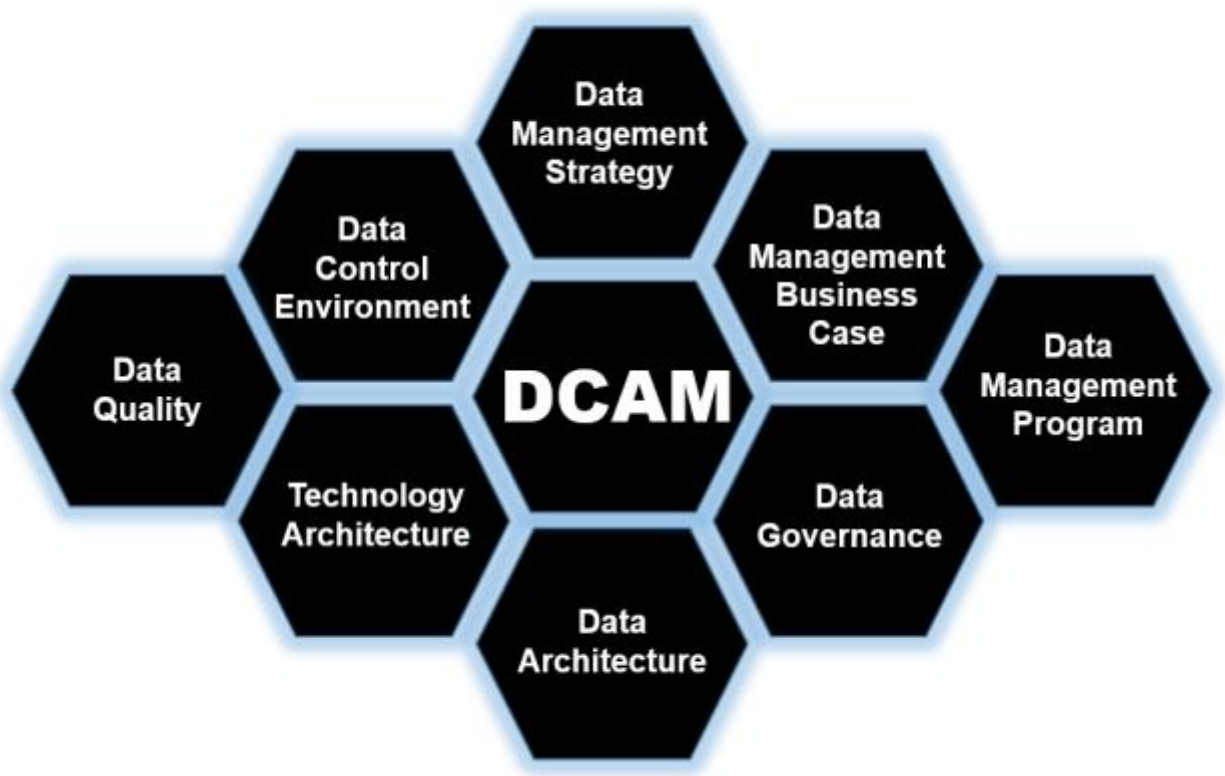


# Data Management Capability Assessment Model

## **DCAM Assessor's Guide**

**Version 1.2.1**





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**EDM Council**  
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# INTRODUCTION

The Data Management Capability Model (DCAM™) was created by the Enterprise Data Management Council based on the practical experiences and hard won lessons of many of the world's leading organizations. It is a synthesis of best practices associated with the management of data content across the horizon of interconnected processes. The Data Management Capability Model defines the scope of capabilities required to establish, enable and sustain a mature data management discipline. It addresses the strategies, organizational structures, technology and operational best practices needed to successfully drive data management. It addresses the tenets of data management based on an understanding of business value combined with the reality of operational implementation.

To manage data in today's organizational environment starts by recognizing that proper data management is about managing data as "meaning". This is a relatively new concept for many organizations. It is not easy to articulate and not very well understood. Data exists everywhere within an organization and must be managed consistently within a well-defined control framework. The DCAM™ helps identify this framework by defining the capabilities required to make data management a critical part of a firms' everyday operational fabric.

The challenges of properly managing data are significant. There are many legacy repositories and a plethora of functions to unravel. There are social and political barriers to overcome. There are real IT challenges and execution gaps to address. Data ownership and accountability are hard to implement. Funding is often project based. And many firms simply don't have the strong executive support that is needed to ensure that the organization stays the course in the face of short term measurement criteria, operational disruption and conflicting stakeholder challenges to properly address the realities of the data management challenge.

We understand this reality because we've been there and we have the scars across our back to prove it. Data is foundational. It is the lifeblood of the organization. The "bad data" tax is a significant expenditure for many firms. Unraveling silos and harmonizing data is the prerequisite for eliminating redundancy, reducing reconciliation and automating business processes. Managing data is essential if we are to gain insight from analytics, feed our models with confidence, enhance our service to clients and capitalize on new (but often fleeting) business opportunities. DCAM™ provides the guidance needed to assess current state, and provide the objectives of target state, for your data program.

The DCAM™ is organized into eight core components.

1. The ***Data Management Strategy*** discusses the elements of a sound data strategy, why it is important and how the organization needs to be organized to implement.
2. The ***Data Management Business Case and Funding Model*** addresses the creation of the business case, its accompanying funding model and the importance of engaging senior executives and key stakeholders for approval.
3. The ***Data Management Program*** discusses what's organizationally needed to stand up a sustainable Data Management Program.
4. ***Data Governance*** defines the operating model and the importance of policies, procedures and standards as the mechanism for alignment among (and compliance by) stakeholders.

5. **Data Architecture** focuses on the core concepts of “data meaning” – how data is defined, described and related.
6. **Technology Architecture** focuses on the relationship of data with the physical IT infrastructure needed for operational deployment.
7. **Data Quality** refers to the concept of fit-for-purpose data and the processes associated with the establishment of both data control and data supply chain management.
8. **Data Control Environment** defines the data lifecycle process and how data content management is integrated into the overall organizational ecosystem.

Each component is preceded with a definition of what it is, why it is important and how it relates to the overall data management process. These are written for business and operational executives so as to demystify the data management process. The components are structured into 37 capabilities and 115 sub-capabilities. These capabilities and sub-capabilities are the essence of the DCAM™. They define the goals of data management at a practical level and establish the operational requirements that are needed for sustainable data management. And finally, each sub-capability has an associated set of measurement criteria to be used in the evaluation of your data management journey.

Welcome to the world of data management. The EDM Council is indebted to the dozens of members who have contributed to the development of the Data Management Capability Model. We are always searching for ways to enhance and improve the model. We encourage your feedback. We are interested in your rants, raves and alternative points of view. For more information on the DCAM™ and on the EDM Council, please contact us at [info@edmcouncil.org](mailto:info@edmcouncil.org)

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## FOREWORD

The concept of data as a foundational component of business operations has arrived. It is now understood as one of the core factors of input into the full spectrum of business and organizational processes. The common theme for firms that are effective in their use of data to reduce operational costs, automate manual processes, consolidate redundant systems, minimize reconciliation and enhance business opportunities is the implementation and management of a data control environment. The reason why firms implement a control environment is to ensure trust and confidence among consumers that the data they are relying on for business processing and decision-making is precisely what they expect it to be – without the need for manual reconciliation or without reliance on data transformation processes.

The core components associated with the implementation of a control environment are needed to ensure that all data elements/attributes are precisely defined, aligned to meaning, described as metadata and managed across the full data lifecycle. The key to establishing a control environment however, is the achievement of “unambiguous shared meaning” across the enterprise as well as the governance of the processes related to ensuring definitional precision. Data must be consistently defined because it represents a real thing (i.e. a product, client, account, counterparty, transaction, legal entity, location, process, etc.). All other processes are built upon this foundation.

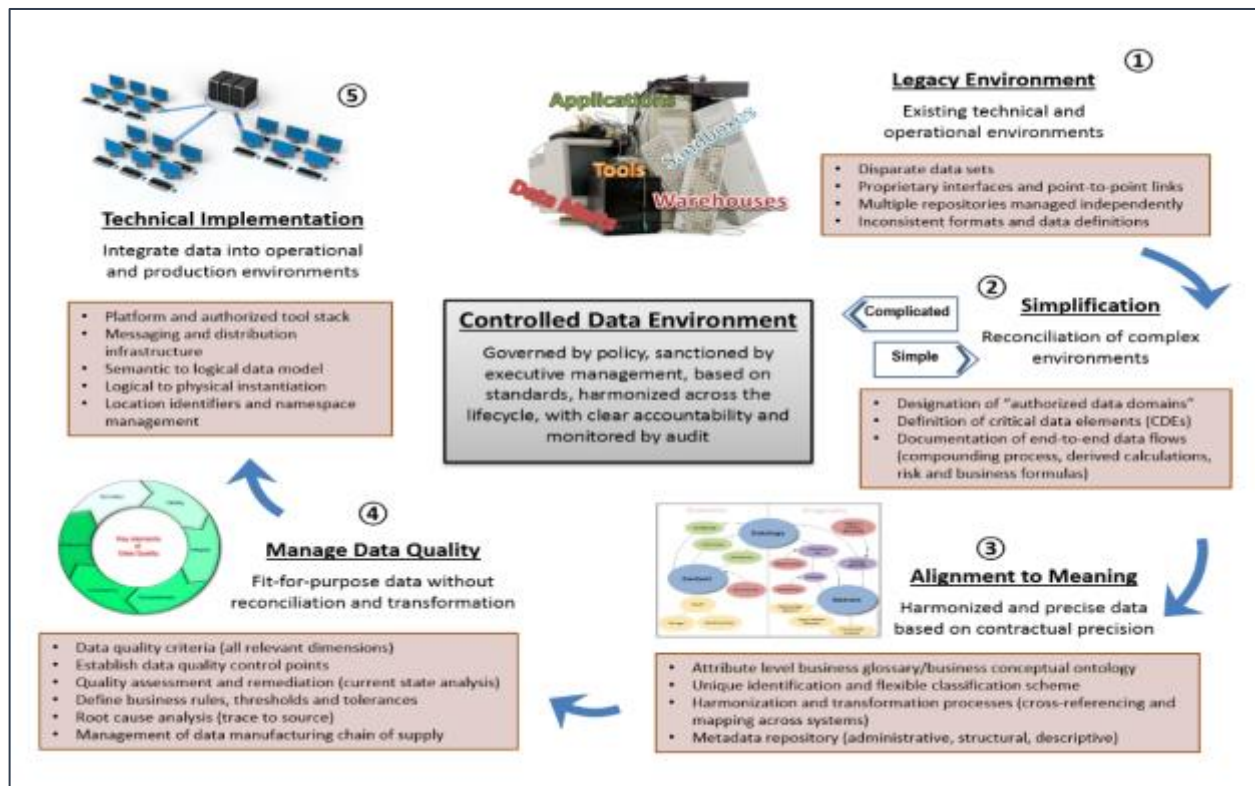
In a fragmented data environment (the opposite of a control environment) applications development can result in ad hoc naming conventions which exacerbate the problem of common terms that have different meanings, common meanings that use different terms and vague definitions that don’t capture critical nuances. For many firms this challenge can be debilitating because there are thousands of data attributes, delivered by hundreds of internal and external sources, all stored in dozens of unconnected databases. This fragmentation results in a continual challenge of mapping, cross-referencing and manual reconciliation. In order to achieve a control environment, every data attribute must be understood at its “atomic level” (as a fact) that is aligned to business meaning without duplication or ambiguity. Managing data as meaning is the key to alignment of data repositories, harmonization of business glossaries and ensuring that applications dictionaries are comparable.

Achieving alignment on business meaning (including the process of how terms are created and maintained) can be a daunting task. It is not uncommon to experience resistance from business users and IT - particularly when there are multiple existing systems linked to critical business applications. The best strategy for reconciliation in a fragmented environment is to harmonize on the legal, contractual or business meaning rather trying to get every system to adopt the same naming convention. Nomenclature represents the structure of data and unraveling data structures/data models are expensive and not necessary. It is better to focus on precisely defining business concepts, documenting transformation processes and capturing real-world data relationships. Once established, existing systems, glossaries, dictionaries, repositories, etc. can be cross-referenced to common meaning.

Managing data as meaning is the cornerstone of effective data management. It needs to be managed along with other “metadata” to ensure consistency and comparability across the enterprise. The other components of metadata can be organized into three core categories: descriptive metadata (i.e. information that identifies where data is located); structural metadata (i.e. information about the physical data layer and how the data is structured) and administrative metadata (i.e. information about when the data was created, its purpose and access rights). Data meaning and metadata management are best understood as the core of your content infrastructure and the baseline for process automation, applications integration and alignment across linked processes.

The implementation and management of a control environment is governed by standards, policies and procedures. These are the essential mechanisms for establishing a sustainable data management program and for ensuring compliance with a control environment in the face of organizational complexity. Managing meaning is the key to effective data management. Meaning is achieved through the adoption of semantic standards. Standards are governed by policy. Policy is established by executive management, supported by data owners and enforced by Corporate Audit. Get the data infrastructure established and governed – it represents the foundation for operational efficiency and must not be compromised.

The following illustration summarized the challenges that a data management professional faces today in their quest to create a control environment.



Summarized into one illustration, achieving a control environment first requires an understanding of the existing legacy data environments (inventory of data; point-to-point links; inconsistent definitions; etc.). Once understood, this disparate environment must be simplified, organized and categorized into defined data domains, with clearly identified data elements and documented data flows. These elements must be aligned to unambiguous shared meaning across the organization through the implementation of controls, policy and governance. Once established, data can now be measured and tracked to ensure quality and consistency with minimal reconciliation. And finally, close alignment to technology throughout this exercise is required to ensure the principles and best practices that have been established are enabled across all the organization's IT infrastructures.

It is this journey that must be taken to bring about a control environment needed to ensure the highest quality of data is delivered to critical functions throughout your organization.



## **Control Environment Capability Objectives**

1. The concept of a control environment is understood by relevant stakeholders and adopted by the organization (standards-based, harmonized across lifecycle, unique identifiers, aligned to meaning). The organization recognizes the need for a control environment to meet business, operational and regulatory objectives.
2. The components associated with a control environment have been defined, verified by stakeholders (i.e. inventoried and confirmed), aligned with technical capability and approved by executive management. Policies, procedures and standards exist for all relevant areas including data quality, data access/distribution, authorized use/entitlement control, data privacy and data security.
3. The framework for implementing a control environment, including reconciliation of disparate systems, have been fully resourced.
4. The standards that are needed to implement the control environment are defined and verified by stakeholders (for relevant products, accounts, clients, business partners, legal entities, counterparties, vendors, etc.). Business processes are identified, documented and aligned with data requirements.
5. Data attributes for relevant business processes are known, segmented according to criticality and understood in the context of how data is compounded/how derived data elements are calculated. Existing systems, processes, repositories and consuming applications across the full data lifecycle are mapped to the control environment standards and aligned with systems of record. Rules and conversion procedures for transformation and cross-referencing are documented. Shared data attributes are identified and mapped to processes and sub-processes.
6. Standard identifiers, metadata and taxonomies are established and integrated across the enterprise for all functions and processes. The process for new standards adoption is documented and implemented.
7. Data in all repositories are aligned to “common meaning” as an ontology. The ontology is modeled and verified by SMEs. There is a common method for defining, achieving agreement, updating and promulgating the concept of “single term, single definition” based on how business processes work in the real world. All changes to the corporate ontology are synchronized and aligned to the systems of record.
8. Procedures are in place to manage changes and exceptions to the control environment.
9. A centralized/aligned metadata repository is implemented and maintained. The metadata repository is managed from descriptive, structural and administrative dimensions.
10. All new product development initiatives, data integration activities and data consolidation efforts use the control environment standards.
11. The control environment is governed across the enterprise with clear accountability. The governance process consists of a combination of IT infrastructure, program management offices,

data administrators and data owners.

12. Compliance with the control environment is monitored, measured and audited. Results of the compliance audit is shared with executive management.
13. Communications mechanisms are in place to ensure that the goals, policies and procedures of the control environment are implemented; that business and IT can communicate with each other; that issues can be escalated as appropriate; that priorities are established; that policies and standards are implemented and that employees are in compliance with the control processes.
14. There is close cooperation between the Board of Directors, executive management, lines of business, information technology and operations on the implementation and management of the control environment. Stakeholders receive training in the policies that exist and the procedures that need to be followed to achieve organizational compliance.
15. Executive management sets expectations and gives authority to implement the control environment. Expectations are translated into incentives and operational constraints. Lines of business are managing within established boundaries. Performance is linked to implementation of the control environment.

## DCAM Scoring Guidance

SCORE	CATEGORY	DESCRIPTION	CHARACTERISTICS
1	Not initiated	Not Performed [Heroes]	Ad hoc activities performed by heroes
2	Conceptual	Initial Planning Stages [Data Management Group]	Issues being debated; white board sessions
3	Developmental	Engagement Underway [Practitioners]	Key functional stakeholders identified; workstreams defined; meetings underway; participation growing; policies, roles, and operating procedures being established; project/annual funding
4	Defined	Defined and Verified [Business Leads]	Business users active; LOB management with P&L responsibility engaged; requirements verified; responsibilities defined and assigned; policy and standards exist; routines in place; lineage underway; CDEs identified; adherence tracked; multi-year/sustainable funding
5	Achieved	Adopted and Enforced [Executive Management]	Executive management sanctioned; proactive business engagement; responsibilities coordinated; policy and standards implemented; lineage verified; data harmonized across repositories; adherence audited; strategic/investment funding
6	Enhanced	Integrated [Board of Directors]	Fully embedded into the operational culture of the organization with the goal of continuous improvement

## 1.0 DATA MANAGEMENT STRATEGY

### Definition:

The Data Management Strategy determines how data management is defined, organized, funded, governed and embedded into the operations of the organization. It defines the long-term vision including a description of critical stakeholder or stakeholder functions that must be aligned. Data Management Strategy demonstrates the business value that the program will seek to achieve. It becomes the blueprint (or 'master plan') that describes how the organization will evaluate, define, plan, measure and execute a successful and mature data management program.

### Purpose:

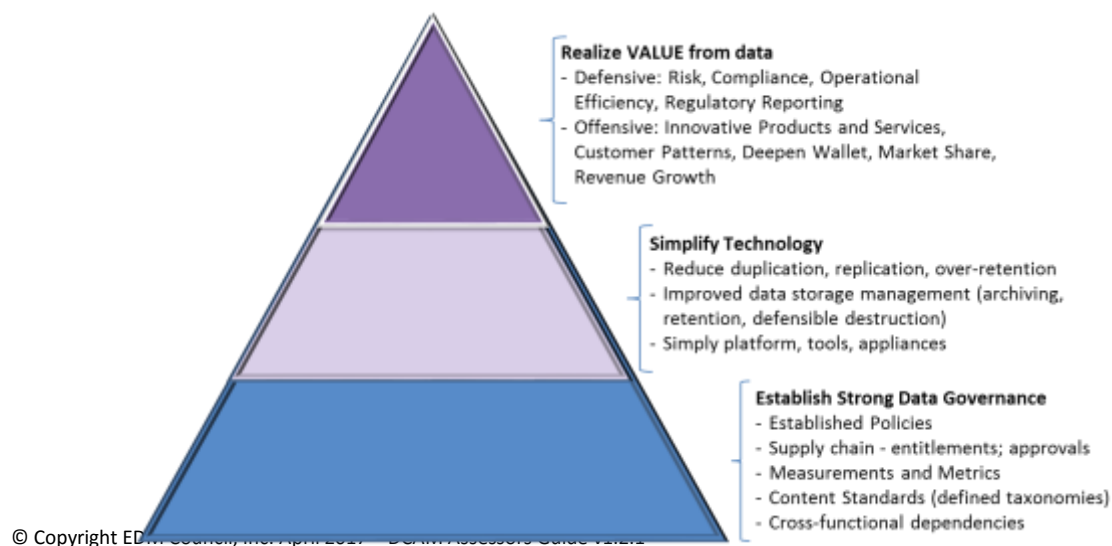
The purpose of developing a Data Management Strategy is to articulate the rationale for the data management program. The strategy defines “why” the program is needed as well as the expected benefits, goals and objectives. The strategy also describes “how” to align and mobilize the organization in order to implement a successful data management program.

### Introduction:

A Data Management Strategy defines the rationale for implementing a data management program. The Data Management Strategy can be developed at the enterprise level, at the line of business, or at the specific data domain - depending on the organizational structure and culture of the organization. The data management strategy explains what the overall program aims to achieve and identifies how the various components of the initiative fit together. A strategy accurately reflects the requirements of the data consumers in order to give confidence to stakeholders that the data management program will be valuable, practical and managed in an effective manner. A data management strategy should emphasize the importance of collaboration as well as the data challenges that result due to the interconnected nature of business processes.

A data management strategy defines the overall framework of the program. It should be structured to address the core principles of data management so that critical stakeholders can understand the value of a data management program as it relates to their functions and strategic initiatives.

The data management strategy should describe how value will be realized from the data assets of an organization, through the collaboration of technology, business and information governance and control.



For a data management strategy to be effective and complete, it needs to:

- Articulate the scope of the data management program
- Establish the priorities for phased implementation
- Provide the guidance for establishing the data governance framework
- Express the importance of developing a data quality program
- Reinforce the use of data content standards.
- Reflect practical implementation reality and alignment to IT and operational capabilities
- Define rational timeframes for implementation
- Address the importance of establishing and staffing the data management program function
- Address the importance of developing a sustainable funding model
- Address the importance of developing evaluative criteria to measure and monitor program progress and effectiveness.

Central to a data management strategy is the articulation of the “target state”. An effective data management strategy describes target state objectives, identifies key stakeholders, discusses organizational structure, accountability and describes the need for discipline and governance. More importantly, a strategy identifies operational inefficiencies and gaps. It is important for a strategy to compare target state to current state in order to show the organizational, functional and technological gaps, and then demonstrate how these gaps will be closed.

Data management strategy is not static and must be able to evolve as the need of the organization change. The most effective and successful data management strategies are those that are visibly endorsed by executive management and are supported by mandatory organizational policy.

### **Goals:**

- Define a strategy that is aligned with the goals and objectives of the organization and ensure this strategy is approved by all relevant business, technology, operational and executive stakeholders
- Explain the importance of establishing a recognized and sustainable data management "program". Define the need for metrics to assess the program and to ensure alignment with established cost/benefit evaluation methodologies.
- Capture high level data requirements. Ensure all relevant corporate audit and regulatory issues have been identified and that key stakeholders understand and agree to the high level requirements.
- Define the process for determining scope and priorities of the Data Management Program. Ensure that the scope of the Program is aligned with defined business value and organizational priorities.
- Make sure the Program can be practically implemented from both a technical and architectural perspective.
- Identify high-level immediate; transitional and long-term deliverables as well as associated resource and funding requirements necessary to implement and sustain the data management program.
- Ensure the data management strategy is clearly articulated and communicated across the organization and is reflected in architectural technology planning.

### **Core Questions:**

- Does the Data Management Strategy clearly articulate the reason and the importance of implementing a separate Enterprise Data Management Program?
- Is there executive, operational, technology and business buy-in? Do stakeholders agree to support and sustain such a program?
- Has the Data Management Strategy sufficiently framed the immediate, medium and long-term goals and objectives of the Data Management Program in line with organizational priorities?
- Has the Data Management Strategy effectively identified the critical areas of focus including how priorities are established and verified?
- Has the Data Management Strategy identified staffing resources, operating model and the funding approach needed to establish, lead and maintain the Data Management Program?

## 1.0 Data Management Strategy

### 1.1 Data management strategy (DMS) is specified and shared with relevant stakeholders

#### 1.1.1 The Data Management Strategy is Developed

*The data management strategy needs to be documented in collaboration with the full spectrum of business, technology and operations management.*

##### **Sub-Capability Objectives**

- DMS has been documented
- DMS has been aligned with business, technology and operations
- DMS has been published to all relevant stakeholders

##### **Advice**

The data management strategy is both a statement of approach and a sales document for stakeholders. Without a formally defined and cohesive strategy, the firm's approach to data management can become reactive. Without collaboration, the strategy can be viewed as irrelevant to the individual stakeholder

##### **Questions**

- Have all the components of the data management strategy been defined and presented in meaningful terms?
- Is the business, regulatory and operational rationales for the data management program defined and verified?
- Is the data management strategy aligned with business requirements, implementation plans, technical capabilities and operational processes?
- Has the DMS been documented and published?
- Is the approach to data management clearly defined?
- Are stakeholders aligned on the specified approach?

##### **Artifacts**

- Vision statement – what the data management program will achieve (target state definition)
- Definition of the “foundational principles” and illustration of why they are essential
- Business requirements and priorities (process for establishing and approving)
- Benefits – why are we doing this and what do I get (value proposition and how it aligns to organizational principles)
- How the content will be managed (authorized data domains, critical data elements, taxonomies and ontology, identifiers, systems of record)
- How data management will be measured (program, outcome, quality, usage)
- How data management will be implemented (architectural principles, cross-functional collaboration, operational capabilities, incremental strategy)
- How stakeholders will be educated and socialized (communication and training)
- How the program will be funded (and monitored)?
- How the program will be governed (organizational structure, policy, controls, stewardship/accountability, audit/enforcement)
- List of stakeholders and evidence of bi-directional feedback
- Mapping of strategy to technical and operational capabilities (with verification)
- Evidence that the strategy was approved and published

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no data management strategy	Discussions about the role, function and structure of the DMS are underway	The DMS concepts are being discussed in collaboration with relevant stakeholders	The working draft of the DMS is created. The draft has been aligned with business, IT and operations. Discussions are underway with relevant stakeholders	The DMS has been documented and published to all relevant stakeholders. The alignment of the DMS with IT, business and operations is verified	

### 1.1.2 The Data Management Strategy is Aligned with High-Level Organizational Objectives

<p><i>High level organizational objectives are those identified by executive management as organizational goals (i.e.: the organizational objective is to improve customer support and services).</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>DMS is fully mapped to and aligned with the high-level organizational objectives</li> <li>DMS is approved by the executive committee and relevant stakeholders</li> <li>Process is established to ensure the future alignment of the DMS to organizational objectives</li> </ul>	<u>Advice</u>	The goal is to ensure that the data management strategy supports the current objectives of executive management. These high-level objectives need to be translated into “data concepts” and evaluated against gaps and inefficiencies (pain points) that currently exist within the organization. A data management program that is not synchronized with the high-level objectives of the organization can result in a misalignment of data priorities and a perception of being irrelevant to executive management. This can reduce the executive “air cover” needed to implement the data management program.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Has the data management strategy been aligned (and mapped) to organizational objectives?</li> <li>Has the alignment been verified and approved by stakeholders and executive management?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Mapping of strategy to organizational objectives to data concepts (with verification from executive committee and stakeholders)</li> <li>Alignment of strategy to capability (i.e. what’s required from the perspective of data architecture, information technology and operations)</li> <li>High-level roadmap on how the strategy will be implemented</li> <li>Evidence of bi-directional feedback</li> <li>Distribution lists and approvals from stakeholders</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no alignment with high-level organizational objectives	The alignment between DMS and high-level organizational objectives is being debated	High level objectives are in the process of being identified and aligned to data management strategy.	High level objectives have been identified. Mapping and alignment of objectives to strategy is verified by relevant stakeholders.	The DMS alignment with high-level organizational objectives has been approved by executive committee.	A process is established to ensure the future alignment of the DMS to organizational objectives



### 1.1.3 The Data Management Strategy Includes an Established Mechanism for Approval

<b><u>Sub-Capability Objectives</u></b> <ul style="list-style-type: none"><li>• Mechanism for capturing feedback from relevant stakeholders exists.</li><li>• Feedback has been collected and incorporated into the DMS.</li><li>• DMS has been reviewed and approved by relevant stakeholders.</li></ul>	<b><u>Advice</u></b> <p>An effective data management strategy needs buy-in from all the key stakeholders within the organization because it has significant operational implications. Stakeholders are more likely to buy-in to the data management program (and make it easier to implement) if they see evidence of their influence over the data management strategy. Data management strategy approval is best managed as an iterative process focused on the needs of business and balanced against the requirements for implementation.</p>				
	<b><u>Questions</u></b> <ul style="list-style-type: none"><li>• Is there a mechanism for obtaining and verifying feedback from stakeholders on the components of the DMS?</li><li>• Is there a mechanism for obtaining and verifying feedback from stakeholders on the implementation strategy?</li></ul>				
	<b><u>Artifacts</u></b> <ul style="list-style-type: none"><li>• Documentation defining the approval process (the mechanism)</li><li>• List of stakeholders (based on function, not individuals because people leave)</li><li>• Distribution lists and evidence of bi-directional feedback</li><li>• Sign-off/approvals</li></ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no approval mechanism	The need for and mechanism to capture feedback is being discussed	The mechanism for collecting feedback is defined and shared with stakeholders	The mechanism for collecting feedback is verified.	Formal mechanism for approval is in place. Feedback has been collected and incorporated into the DMS. The DMS is approved by named stakeholders	

#### 1.1.4 The Data Management Strategy has been Evaluated as Being Enforceable

<u>Sub-Capability Objectives</u> <ul style="list-style-type: none"><li>• Audit has reviewed and approved the DMS.</li><li>• Audit has determined that its implementation can be enforced via existing corporate audit examinations</li></ul>		<u>Advice</u>	Engagement with audit is an important way to ensure that the data management program is viable from an organizational point of view. This will probably require education of audit about data management concepts and principles. This early stage activity (and the development of a partnership) with audit can also help ensure their engagement in oversight as a priority. If the DMS can be audited, it becomes “real” in the eyes of both the organization and the regulators. Audit can be a good friend to the implementation of a sustainable data program.		
		<u>Questions</u>	<ul style="list-style-type: none"><li>• Is audit familiar with the concepts associated with data management?</li><li>• Has audit reviewed and determined that the data management program can be audited via scheduled exams?</li></ul>		
		<u>Artifacts</u>	<ul style="list-style-type: none"><li>• Communication with audit about the concepts in the DMS</li><li>• Review and approval of the data management strategy</li><li>• Verification that the DMS can be enforced and audited</li></ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no alignment between the DMS and related audit processes	The auditability of the DMS is under discussion.	Audit is reviewing the DMS.	Feedback from audit has been collected and is being incorporated into the DMS.	Audit has reviewed and determined that the DMS can be audited via scheduled exams.	Audit is actively conducting examinations of data programs to ensure adherence to the DMS

## 1.2 High level business requirements are captured, prioritized, and integrated into the DMS

### 1.2.1 High-Level Business Requirements have been Documented and Used to Create the DMS

<p><i>High level business requirements are those identified by the lines of business, often reflecting the high level organizational requirements identified by executive management. It is important that the DMS reflect both the organizational requirements as well as high level LOB requirements.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>High level business requirements for critical business lines and corporate functions have been documented.</li> <li>High level business requirements for critical business lines/corporate functions have been verified and incorporated into the DMS.</li> </ul>	<p><u>Advice</u></p> <p>High-level business requirements (objectives, goals, pain points and priorities) are derived based on discussions with representatives from the lines of business. The discovery process and verification of these requirements is done on an iterative basis and needs to be balanced against operational reality as well as budgetary requirement. The goal is not only to define requirements/objectives – but to prioritize them based on dependency, budget and implementation reality. The overall objectives of the data management strategy are confidence (based on defined objectives) and buy-in (including how the program will operate and what it will mean to/what is expected from the various stakeholders).</p> <p>The investment in a shared understanding of the objectives of the data management strategy is essential if you want stakeholders to buy-into the long view. You don't want to build a data management strategy in a vacuum – make sure it reflects the requirements of the LOB.</p>				
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>Have the objectives of the data management program been defined and verified?</li> <li>Have the high-level business requirements been incorporated into the DMS?</li> <li>Have the business requirements been verified, prioritized and sequenced?</li> </ul>				
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>Documentation of the high-level requirements and objectives (verification)</li> <li>Process for establishing priorities and sequences (approved)</li> <li>Bi-directional communication</li> </ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no formal relationship between business requirements and data management	High level business requirements related to data management are under discussion	High level business requirements are being identified. Alignment of the data management strategy to these requirements is in process and shared with relevant stakeholders.	The alignment of high level business requirements in the DMS have been verified.	High level business requirements have been defined and incorporated into the DMS	

## 1.2.2 Requirements Incorporated into the DMS have been Prioritized and Approved

<b><u>Sub-Capability Objectives</u></b> <ul style="list-style-type: none"><li>Business requirements (incorporated into the data management strategy) have been reviewed, prioritized and approved by identified stakeholders.</li><li>Regular requirements review cycles have been established.</li></ul>	<b><u>Advice</u></b>	This should be linked to the process for defining priorities and high-level organizational objectives. Regulators, auditors and stakeholders will want to understand how the firm is addressing the flow of priorities and how they are correlated to both funding and operational realities. Discussions about funding can unveil real LOB priorities. This prioritization and approval process will clarify what will be (as well as won't be) done as part of the data management program. It is also important to define and expose how the firm will deal with new issues as they arise.			
	<b><u>Questions</u></b>	<ul style="list-style-type: none"><li>Has the process for prioritizing and approving high-level business requirements been prioritized and approved?</li><li>Have the priorities included links and dependencies?</li><li>Have the priorities been aligned with data concepts, budget, IT and operations (and verified)?</li><li>Is there a process for review and prioritization of new requirements?</li></ul>			
	<b><u>Artifacts</u></b>	<ul style="list-style-type: none"><li>Documentation of the prioritization process (process diagrams)</li><li>Documentation of priorities (verified, approved)</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no prioritization or approval process	The need for a prioritization of requirements is being discussed	The process of prioritizing requirements is taking place and being shared with relevant stakeholders.	Business priorities have been identified and verified.	Business requirements have been reviewed, prioritized, approved by stakeholders and incorporated into the DMS	Regular business requirements review cycles have been established

### 1.3. The DMS defines the importance of identifying, prioritizing and assuring the appropriate use of authorized data domains.

#### 1.3.1. The DMS calls out the need to identify and prioritize authorized data domains.

<p><i>Data domains are logical categories of data that are designated as prioritized factors of input into critical business functions. For example, “trade data” or “regional sales data” could be designated as authorized data domains. Data domains are identified based on the strategic understanding of business requirements and an awareness of the organizational priorities.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>DMS defines the importance of identifying and prioritizing data domains.</li> <li>DMS defines the need to create and govern the data domain inventory.</li> </ul>	<u>Advice</u>	Define the concept (and importance) of authorized data domains within the DMS. Establish the principles associated with defining, verifying, mapping dependencies and ensuring the appropriate usage of ADD. In general terms, expect the organization to define between 12-18 domains of data. The specific definitions of ADD are created in collaboration with LOB – but the discussion about “what is a domain” and “whether domains are to be based on risk areas or customer profiles” needs to be incorporated into strategy. The concept of ADD needs to be combined with the concept of “toll gates” to ensure that stakeholders are using the appropriate/authorized data domain.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Has the concept of authorized data domains been created in collaboration with business?</li> <li>Has the importance of authorized data domains been socialized?</li> <li>Are the concepts associated with toll gates defined and socialized?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Definition of the concept of authorized data domains</li> <li>Definition of the concept of toll gates</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
DMS does not reflect the authorization process for data domains	The concept of authorized data domains is under discussion	The concept of data domain management is being developed and shared with relevant stakeholders.	The importance of designated data domains is defined and verified.	The DMS defines the requirements needed to create and govern the data domain inventory	

#### 1.3.2. The DMS articulates the importance of establishing policy to enforce appropriate use of authorized data domains

<p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>DMS defines the need for established policy about the use of authorized data domains.</li> <li>DMS defines the need for governance over the use of authorized data domains.</li> </ul>	<u>Advice</u>	The concept of authorized data domains (and their dependencies) is important enough to be incorporated into data management policy. This concept needs to be explicit and understood by all stakeholders.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Has the concept of authorized data domains been incorporated into the data management strategy?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Data management strategy</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
DMS does not reflect the concept of enforcing the use of authorized data domains	The need for policy and governance of authorized data domains is under discussion	The need for enforcing data domain usage is being developed and shared with relevant stakeholders	The process for enforcing data domain usage is defined and verified by relevant stakeholders.	The DMS defines the need for policy and governance over the use of authorized data domains	

## 1.4. The DMS is aligned with and mapped to architectural, IT and operational capabilities

### 1.4.1. Data architecture concepts have been incorporated into the DMS.

<p><i>Data architecture focuses on the design, definition, management and control of data content. This includes giving data business meaning, describing its metadata, and designing and managing taxonomies and ontologies (See Information Architecture)</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Data architecture concepts are defined and incorporated into the DMS.</li> <li>• Data architecture concepts are aligned with stakeholder plans and roadmaps.</li> <li>• Data architecture concepts are approved by relevant stakeholders.</li> </ul>	<u>Advice</u>	The importance of data as a representation of “real things” including how it is defined and shared is absolute. The notions of “taxonomies” (hierarchical structure) and “ontology” (definitions, interdependencies and relationships) must exist as a core component of DMS. It is essential that stakeholders understand this data content engineering concept and are part of this process so they can help articulate requirements from a data (not IT) perspective. This discussion holds the potential to bring a lot of stakeholders (IT, architects, business, operations) into collaboration about the objectives of the data management program. Once the concept of data content engineering is understood, it must be aligned with both IT (integration) and operations (process management).
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Do stakeholders understand the differences between “data processing” and “data content?”</li> <li>• Have the foundational concepts of “identify,” “describe” and “locate” been articulated in the DMS?</li> <li>• Have data architecture concepts been aligned with stakeholder plans and roadmaps?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Lists of (business, IT, operations, architecture) stakeholders</li> <li>• Bi-directional communication about data engineering concepts</li> <li>• Evidence (minutes, agendas) about the alignment of data architecture with IT and operations</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data architecture concepts are not defined in the DMS	The importance of data architectural concepts are under discussion	Data architectural concepts are defined and shared with involved stakeholders	Data architectural concepts are verified and accepted by involved stakeholders	Data architecture concepts are defined and incorporated into the DMS, aligned with stakeholder plans and approved	

### 1.4.2. Technology concepts have been incorporated into the DMS.

<p><i>Technology concepts refer to the strategy, design and implementation of the physical infrastructure (platforms and tools) in support of the DMS.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Technology concepts are incorporated into the DMS.</li> <li>• Technology concepts are aligned with stakeholder plans and roadmaps.</li> </ul>	<u>Advice</u>	Ensuring the alignment of IT with data architecture is critical. IT should be viewed as the implementation partner for the data management program. It is just as important to align the data objectives with IT reality. Invest in this IT partnership, it is essential for long-term success of the data management program.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Have the IT concepts related to the data management program been defined, verified and accepted?</li> <li>• Have IT concepts been aligned with stakeholder plans and roadmaps (verified and approved)?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• List of IT stakeholders</li> <li>• Alignment of IT concepts with stakeholder plans and roadmaps</li> </ul>

<ul style="list-style-type: none"> <li>Technology concepts are approved by relevant stakeholders.</li> </ul>		<ul style="list-style-type: none"> <li>Bi-directional communication between ODM and IT</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Technology concepts are not defined in the DMS	The importance of technology concepts are being debated	Technology concepts are defined and shared with involved stakeholders	Technology concepts are verified and accepted by involved stakeholders	Technology concepts are aligned with stakeholder plans/roadmaps, approved and incorporated into the DMS	
<b>1.4.3. Operational concepts have been incorporated into the DMS.</b>					
<i>Operational concepts include such areas as uptime requirements; business continuity planning; retention and archiving guidelines; defensible destruction requirements; privacy standards; etc.</i>  <b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Operational concepts are incorporated into the DMS.</li> <li>Operational concepts are aligned with operational goals and objectives.</li> <li>Operational concepts have been approved by relevant operations groups.</li> </ul>		<u>Advice</u>	The data management strategy must reference operational objectives (i.e. uptime, quality criteria, BCP, retention and archive, defensible destruction).		
		<u>Questions</u>	<ul style="list-style-type: none"> <li>Have the operational concepts been defined, verified and accepted?</li> <li>Have the operational concepts been incorporated into the data management strategy?</li> </ul>		
		<u>Artifacts</u>	<ul style="list-style-type: none"> <li>List of operational stakeholders</li> <li>Evidence of alignment of operational concepts into the DMS</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Operational concepts are not defined in the DMS	Inclusion of operational concepts into the DMS are being discussed	Operational concepts have been identified and shared with relevant stakeholders	Operational concepts have been verified and accepted by relevant stakeholders	Operational concepts are aligned with stakeholder plans/roadmaps, approved and incorporated into the DMS	

## 1.5. The DMS requires the creation of a formally established governance program.

### 1.5.1. The DMS defines the purpose and objectives for establishing data governance

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>The DMS specifies the need for the creation of a data governance program.</li> <li>The DMS articulates the purpose, objectives and expected outcomes of the data governance program</li> </ul>	<u>Advice</u> <p>Governance focuses on the organizational requirements necessary to ensure that the objectives of the data management program can (and will) be implemented. It is critical that the organization understands what they are governing as well as the practical aspects of getting stakeholders to alter behavior before seeking to implement operational governance structure.</p> <p>Don't lead with governance details too early in the data management program development cycle. At the strategy level, the primary goal is buy-in to the fact that data management is a mandatory activity – and that it will change the way people operate. Early and interactive engagement with critical stakeholders will help reinforce buy-in. Think of this as “crafting the governance deal” with an appropriate balance between the concepts of governance (clarity on need), the value of governance (coordination and predictability) and the impact of governance (operational and cultural implications).</p>				
	<u>Questions</u> <ul style="list-style-type: none"> <li>Is the purpose, objectives and expected outcomes from the governance process defined and verified</li> <li>Has the high-level operational approach been defined, reviewed and approved?</li> </ul>				
	<u>Artifacts</u> <ul style="list-style-type: none"> <li>Documentation on the purposes and objectives of governance</li> <li>List of stakeholders (evidence of bi-directional communication)</li> </ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data governance concepts are not identified in the DMS	The importance of data governance is under discussion	Data governance concepts are defined and shared with involved stakeholders	Data governance concepts are verified and accepted by involved stakeholders	Data governance concepts and objectives have been defined, approved by relevant stakeholders and incorporated into the DMS	



### 1.5.2. The DMS describes the data governance operational approach

<p><i>The operational objectives and approach associated with the data governance program (i.e.: policy driven; centralized vs. federated, assignment of authority, etc.) are addressed in the DMS</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>High level objectives of data governance are addressed</li> <li>The operational objectives are described.</li> </ul>	<u>Advice</u>		This is the place to address (up-front) some of the more challenging organizational issues about how data governance will affect stakeholders. Don't underestimate the difficulties associated with (or minimize the importance of) getting agreement on essential concepts like authority, policy and control.		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>Has the high-level operational approach been defined, documented and verified?</li> <li>Does it cover the core areas (i.e. federated vs. centralized vs. hybrid, the role of policy, the types of roles, coordination processes, role of standards, concept of CDEs, requirements for authorizations)?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>Documentation of operational approach</li> <li>List of stakeholders and evidence of communication</li> <li>Verification and approval of operational approach</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
How the data governance program will operate has not been addressed	The data governance operational model is being discussed	The high-level operational design of the governance model is being discussed and debated, for inclusion into the DMS	The high-level data governance operational approach has been designed, and has been reviewed and approved by relevant stakeholders	The high-level data governance organizational approach is included in the DMS.	

### 1.5.3. The DMS describes the governance structure, roles and responsibilities

<p><i>High-level structure, roles and responsibilities of the data management organization as well as the roles and responsibilities of the business-line data executives and data stewards are addressed in the DMS.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>The DMS describes the target state structure of the governance program</li> <li>The DMS identifies the relevant governance stakeholder roles and responsibilities.</li> </ul>	<u>Advice</u>		This is about how the governance process will work in reality. It is important to evaluate roles and functions from all perspectives including sponsors (executive authority), owners (accountable parties), and stewards (both business stewards to manage content and IT stewards to manage technical implementation).		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>Has the high-level structure been defined and socialized?</li> <li>Have the roles and responsibilities of the data management organization been defined and verified?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>Documentation of high-level roles and responsibilities</li> <li>Distribution lists and evidence of communication</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
The data governance structure, roles and responsibilities are not addressed in the DMS	Governance structure, role and responsibility concepts are being discussed	Governance concepts are being developed.	Governance concepts are defined and are being discussed with relevant stakeholders	Governance structure, role and responsibility concepts are incorporated into the DMS	

## 1.6. The DMS defines how the data management program will be measured and evaluated.

### 1.6.1. The DMS defines the importance of developing program metrics (tracking and adherence metrics) to determine how the data management program itself will be measured

<p><i>Program metrics focus on the progress of the data management program including implementation, operational effectiveness and the progress that stakeholders are making in aligning and adhering to data policies and standards.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• The DMS calls for the development of metrics to track program progress and measure adherence</li> <li>• Metric plans are socialized with relevant stakeholders.</li> <li>• Feedback is received and incorporated into the data management strategy.</li> <li>• Stakeholders review and approve the metric plans and approach</li> </ul>	<u>Advice</u>		The goal within strategy is to call out the need for metrics, define the conceptual categories that will be measured and let stakeholders know that they will be evaluated. We would expect to see measurement concepts that relate to the data management program (policy, standards, skill sets, roles and responsibilities, governance processes, stewards appointed, etc.) as well as notification that these metrics will be used to ensure the success of the DMP.		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>• Has the concept of metrics related to the data management program itself been defined?</li> <li>• Have the program-related metric plans been socialized and verified?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>• Definition of program metric categories within the strategy documents</li> <li>• Roster of stakeholders and evidence of bi-directional communication</li> <li>• Approvals and sign-off</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
The need to develop program tracking metrics is not addressed in the DMS	The concept of developing program tracking metrics is being discussed	Program metric concepts are being developed	Program metrics concepts are defined, and have been shared with and approved by relevant stakeholders	Program metric concepts are incorporated into the DMS	

### 1.6.2. The DMS defines the importance of developing metrics to determine and track data quality

<p><i>Data quality metrics are part of an overall data quality strategy and program. DMS must identify the importance of developing practical data quality metrics to ensure critical data is accurate, complete and fit for purpose.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>The DMS calls for the development of data quality metrics</li> <li>DQ metrics (and DQ plans) are socialized with relevant stakeholders</li> <li>Feedback is received and incorporated into the DMS</li> <li>Stakeholders review and approve the data quality metric strategy, plans and approach</li> </ul>	<u>Advice</u>	<p>This is about defining the measurements of quality and the concepts of fit-for-purpose data. We would expect to see measurement concepts related to accuracy, consistency, timeliness, conformance to standards, coverage, duplication and consistency – both qualitative and quantitative.</p> <p>Stakeholders need to be clear that metrics are designed to identify process weaknesses and drive remediation.</p>
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Does the DMS call for the development of metrics related to data quality?</li> <li>Are the categories and objectives socialized and verified?</li> <li>Is the process for defining fit-for-purpose embedded into the DMS?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Criteria used to evaluate data quality</li> <li>Distribution lists and evidence of bi-directional feedback</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
The approach to tracking data quality is not addressed in the DMS	Data quality metrics are being discussed	Data quality metric concepts are being developed	High-level data quality metric concepts are defined, and have been shared with and approved by relevant stakeholders	Data metric concepts are incorporated into the DMS	The approach to tracking data quality is not addressed in the DMS

### 1.6.3. The DMS defines the importance of developing outcome metrics to determine the effectiveness of the data management program

<p><i>Outcome metrics are measurements of the net effect of the data management program. Types of outcome metrics would include such items as lowering of operational fails, streamlined reporting, reduction in data reconciliations, improved data discovery and access to critical data, etc.)</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"> <li>• The DMS calls for the development of outcome metrics.</li> <li>• Outcome metric plans are socialized with relevant stakeholders</li> <li>• Feedback is received and incorporated into the DMS</li> <li>• Stakeholders review and approve the outcome metrics plans and approach</li> </ul>	<u>Advice</u>		So what are we getting for our compliance with the data program? Stakeholders need to understand the concept of “factor of input” and “data interoperability” and “harmonization” and “process automation.” It is important to measure value – but remember - data is only one input component. It is quite possible to have good data, but not achieve the desired outcome because of some operational deficiency. Measuring areas such as STP, reduction of repairs, improved discovery, consolidation of IT are multi-dimensional and not always easy to trace back to data management. When all else fails – send them to this link ( <a href="#">Aristotle Metaphysics</a> )		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>• What are the expected operational outcomes associated with data management and proper data hygiene?</li> <li>• How will the organization measure both the defensive (risk and cost) and the offensive (predictive analytics, market penetration) value of data management?</li> <li>• Do stakeholders understand the core concepts associated with data as a trusted factor of input?</li> <li>• Do stakeholders understand the concepts of linked analysis and causality?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>• Outcome metric categories</li> <li>• Statements about the role of data as a trusted factor of input (i.e. can you respond to this line of questioning)</li> <li>• Distribution lists and evidence of bi-directional communication</li> <li>• Copies of college diploma where they were supposed to learn basic concepts associated with understanding compound relationships</li> </ul>		

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
The need to develop outcome metrics are not addressed in the DMS	The concept of outcome metrics are being discussed	Outcome metric concepts are being developed.	Outcome metric concepts are defined, and have been shared with and approved by relevant stakeholders	Outcome metric concepts are incorporated into the DMS	

## 1.7. The data management strategy calls for the creation of a communication and training program

### 1.7.1. The DMS describes the importance of establishing a communication strategy

<p><i>A communication strategy is a critically important component of a data management strategy and must be designed and implemented according to the culture of the organization. A communication strategy heightens awareness and informs stakeholders of the goals, objectives, scope, priorities, policies and standards of the data program.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>DMS identifies the need for a communication strategy.</li> <li>DMS defines the goals and objectives as well as the scope and core components of the communication strategy</li> </ul>	<u>Advice</u>		Communications is not a sideline activity. It would benefit from a dedicated staff of professionals. Introduce the concept of continual communications to reinforce data management concepts - this is not a “one and done” process. Think about a variety of communications channels and mechanisms to keep the content fresh. Think about ways to involve the full spectrum of participants (i.e. PR, HR, executive management, audit) in the communications program. There are lots of subtle (but critical) concepts like the difference between “correcting bad data” and “fixing data problems at the source.” Be sure to understand that communication is a two-way street - and needs a mechanism for discussions about value derived vs. the inevitability of operational disruption.		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>Has the importance of communication and training been defined as part of the data management strategy (including onboarding of new employees)</li> <li>Does the communications strategy define the core goals and objectives of the data management program (i.e. data objectives vs. governance vs. ecosystem vs. integration)?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>Communications program definition and components</li> <li>List of stakeholders (bi-directional communication)</li> <li>Definition of mechanisms for engagement</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
The need for a communication strategy is not addressed in the DMS	The need for a communication strategy is being discussed	The concepts of a communication strategy are being developed	The concepts of a communication strategy are defined and shared with relevant stakeholders	Communication strategy concepts are incorporated into the DMS	

### 1.7.2. The DMS Describes the Need for an Education and Training Program

<p><i>An education and training program is needed to ensure stakeholder understanding, buy-in and compliance to the data management program</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>DMS defines the need for training on the purpose and objectives of the data management program.</li> <li>The DMS addresses the approaches and methodologies for a comprehensive data management training program.</li> </ul>	<u>Advice</u>		Training has a broad scope and all components need to be included in the data management program. Consider areas such as “functional” training (i.e. the role of the data steward); “operational” training (the implications of the data management program and where stakeholder go for support); “concept” training (why data management is critical and what is meant by adopting a data management culture); and “dependency” training (how to collaborate to effectively manage data assets). The objective is continual reinforcement of the objectives of the data management program. Top-of-the-house support of the training program resonates across the organization (and helps loosen purse strings). Look for opportunities to partner with human resources and ways to tie data management (and training) into compensation and retention.		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>Has the importance of training been defined as part of the data management strategy?</li> <li>Have the components of the data management training program been evaluated for completeness and value?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>Training program definition and components</li> <li>Approaches and methodologies to be used</li> <li>List of stakeholders and evidence of bi-directional communication</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
The need for an education and training program is not addressed in the DMS	The need for an education and training program is being discussed	The concepts of an education and training program are being developed	The concepts of an education and training program are defined and shared with relevant stakeholders	Education and training program concepts are incorporated into the DMS	

## 2.0 THE DATA MANAGEMENT BUSINESS CASE AND FUNDING MODEL

### **Definition:**

The Data Management Business Case is the justification for creating and funding a data management program. The DM Business Case answers the "why" questions. It addresses the "so what" challenges. It articulates the major data and data related issues facing a firm or business function and describes the expected outcomes and benefits that can be achieved through the implementation of a successful data management program.

Data Management Funding Model provides the rationale for the investment in data management, the mechanism to ensure the allocation of sufficient capital needed for implementation and the methodologies used to measure both the costs and contributions derived from the data management program. Together, the Data Management Business Case and the Data Management Funding Model are critical steps needed to ensure program stakeholder commitment and agreement to the overall objectives of the program.

### **Purpose:**

Data Management is no different than any other established business process. It needs to be justified, funded, measured and evaluated. The Data Management Business Case provides the rationale for the investment in data management. It provides clarity of purpose, enabling agreement and support of program objectives from senior executives as well as program stakeholders. The Data Management Funding Model describes the overall framework used to ensure that the objectives and processes of data management become a sustainable activity within the organization.

### **Introduction:**

*The Data Management Business Case* is the cost/benefit realization of the set of activities and deliverables expected from data management program. The data management business case answers the question, "why the firm is focusing on data management" and helps achieve alignment across the stakeholders. The business case helps management understand the costs, benefits and risks associated with the evolution of the data management program. It is essential to link the business case with realistic strategic and tactical measurement criteria and align them with the long term sequence plan for the data management program. This enables the organization to understand the total costs associated with implementation as well as maintenance of the data management program and helps ensure that it is sufficiently funded to meet both near term and long range objectives.

The data management business case articulates the benefits of the data management function, in alignment with the objectives defined, communicated and agreed upon in the Data Management Strategy. It discusses both the "defensive" benefits of the program (operational cost reduction, improved regulatory reporting, streamlined risk management, controlled data governance, improved data quality), as well as highlighting the "offensive" benefits of the program (improved customer service, innovative product development, increased revenues, improved market penetration).

In some cases, the best way to build the business case is through a demonstrative "proof of concept" or "pilot" project. In these instances, a specific pain point or high-profile business objective would be selected and used to demonstrate the benefits of implementing the data management program. If this approach is used, it is important to select a project that is achievable and can provide quick wins in order to build confidence among stakeholders on the foundational elements of the program to ensure

sustainability. Regardless of whether you define the business case with or without a proof of concept, all activities must align to the strategic business objectives for the organization.

*The Data Management Funding Model* defines the mechanism used to generate and maintain capital needed for the data management program throughout its lifecycle. It establishes the methodology used for cost allocation among business lines and can be used to help align stakeholders on funding-related issues. In mature organizations, the funding model reflects the individual requirements of the various components of the organization and is integrated with governance to ensure that appropriate oversight and accountability is applied to data management. Verifiable metrics are essential and must be aligned with tangible business objectives. A well-structured funding model can help avoid debates over business priorities, mitigate internal competition and facilitate open discussions among relevant stakeholders.

Strong consideration should be given to allocating initial funding the data management program as an enterprise expenditure rather than an individual LOB or 'grass roots' approach. Grass roots funding can become mired by competition among business units, is often aligned with a tactical view of data management and frequently reinforces short-term evaluation cycles. An organization can expect its funding model to evolve along with the maturity of their data management program.

There is no single model for funding data management initiatives. The specific model implemented will depend on the dynamics and operational culture of the individual firm. Some organizations will fund centrally, others will fund through the lines of business, while still others may take a hybrid or federated approach. There are pros and cons to all of these approaches. Whichever is selected, the fundamental components of the funding model, such as: investment criteria/priorities, budget management, delivered versus expected benefits, allocation methodology and capital needed for ongoing management of the program, should always be included. And, most importantly, the funding model must reflect a multi-year journey, incorporating both initial program implementation costs as well as sustainable ongoing funding. Data management must become a day-to-day operation and must be funded accordingly to ensure it becomes part of the fabric of an organization's operation.

#### **Goals:**

- Create a data management business case based on verified input from stakeholders across lines of business that incorporate both strategic and tactical objectives of the data management program
- Align the business case to the agreed-upon business drivers and organizational objectives
- Ensure the business case has been socialized and agreed to by program stakeholders to ensure commitment and support of the data management objectives
- Establish a funding model that supports the agreed upon Data Management Business Case and fits with the culture of the organization in order to ensure buy-in from program stakeholders and commitment to sustainability.
- Create a mechanism to ensure that the business case remains aligned with business objectives as the organization evolves and matures.

#### **Core Questions:**

- Are the strategic goals of the organization reflected in and aligned with the Data Management Business Case and Funding Model?
- Is the Funding Model sufficient to support the implementation the data management program.



- Have the funding requirements been translated into the business case and aligned with the objectives, sequence priorities and implementation roadmap of the data management strategy
- Does the funding model cover all aspects of data management (e.g.: tangible, intangible, special requests, urgent requirements, unique applications, etc.)
- Is there a defined process with established criteria for determining and verifying the investment required for data management and is it aligned with the business structure, priorities and governance process organization.

## 2.0 Data Management Business Case and Funding Model

### 2.1. The data management business case is aligned to strategic drivers and tangible business outcomes.

#### 2.1.1. The data management business case is mapped to and aligned with the data management strategy

<p><i>The data management business case must align and reflect the enterprise and business-line objectives, drivers and requirements as detailed in the data management strategy.</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"><li>• The DM Business Case is mapped and aligned with organizational priorities and objectives.</li><li>• The DM Business Case is aligned with the strategic business line priorities and objectives</li></ul>		<p><u>Advice</u></p> <p>The Data Management Business Case is the justification for creating and funding a data management program. The DM Business Case answers the "why" questions. It addresses the "so what" challenges. It articulates the major data and data related issues facing a firm or business function and describes the expected outcomes and benefits that can be achieved through the implementation of a successful data management program.</p> <p>The business case can incorporate a combination of ‘defensive’ (regulatory, risk, compliance) and ‘offensive’ (business enablement, analytics, operational efficiencies) objectives. Core objectives have to be defined. Implementation approaches have to be articulated. The value propositions need to be clearly stated in ways that are meaningful to stakeholders.</p>			
		<p><u>Questions</u></p> <ul style="list-style-type: none"><li>• Does the justification of the business case align with the data management strategy?</li><li>• Are the objectives defined and verified?</li><li>• Are the value propositions clearly specified?</li></ul>			
		<p><u>Artifacts</u></p> <ul style="list-style-type: none"><li>• Business case documentation</li><li>• Alignment between business case, strategy, organizational objectives and priorities</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no business case for data management	The alignment of the data management business case to drivers, requirements and strategy are under discussion	The draft business case is being reviewed by stakeholders.	The business case is aligned with business objectives and strategic priorities of the lines of business. Stakeholder feedback is captured and incorporated	The business case is mapped to (and aligned with) organizational priorities and objectives	

### 2.1.2. High level business outcomes are defined and sequenced.

<p><i>A primary function of the business case is to define the challenges of the current state and to define the pathway to improvement.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Expected outcomes are defined and sequenced.</li> <li>Current-to-Target State is defined and articulated</li> </ul>	<u>Advice</u>	Data is a core factor of input into many business processes. Dependencies have to be defined and verified across the organization. Because of the scope and breadth of data management, issues need to be prioritized and sequenced. This process needs to be formal (and transparent) if you are to avoid confusion and manage expectations. Strong communication about priorities, sequences and dependencies is essential.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Have data access and delivery dependencies been defined and verified?</li> <li>Have critical data management concepts been aligned with business outcomes (prioritized, sequenced and verified)</li> <li>Is there a communication strategy in place to provide visibility and transparency to stakeholders?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Definition of business outcomes</li> <li>Sequence plans and schedules</li> <li>Stakeholder communication (feedback on priorities)</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Business outcomes from the data management initiative are not defined	The expected outcomes and sequence plans from the data management initiative are being formulated	The expected outcomes and sequence plans from the data management initiative are under review by involved stakeholders	Expected outcomes from the data management initiative are defined and sequenced	Current to target state is defined and documented	

### 2.1.3. The data management business case is socialized and validated by program stakeholders.

<p><i>Buy-in is predicated on stakeholder validation of the viability of the proposed program</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>The DM Business Case has been socialized to program stakeholders.</li> <li>Target objectives have been reviewed and validated.</li> <li>Outcomes, benefits, timelines and target thresholds have been reviewed and approved.</li> </ul>	<u>Advice</u>	Key stakeholders (executive management, LOB decision makers) must review the business case and validate both objectives and approaches. This process needs to be formalized and ongoing as new priorities are introduced and existing ones are completed.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Has the business case been socialized to the relevant stakeholders?</li> <li>Have target objectives been reviewed and verified?</li> <li>Have outcomes, benefits, timelines and thresholds been approved?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Stakeholder lists</li> <li>Evidence of business case distribution</li> <li>Mechanism for verification and validation by stakeholders</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no business case for data management	The processes associated with developing a data management business case are being discussed	The high level business case has been socialized with program stakeholders. Feedback has been captured	Target objectives have been reviewed and verified	Outcomes, benefits, timelines and thresholds have been reviewed and approved	

## 2.2. The data management funding model has been established, approved and adopted by the organization.

### 2.2.1. The DM funding model is matched to business requirements, implementation timelines and operational capabilities.

<b><u>Sub-Capability Objectives</u></b> <ul style="list-style-type: none"> <li>DM funding model is proposed and socialized with program stakeholders.</li> <li>Feedback is being collected and incorporated into the model.</li> <li>Key business driven data requirements are properly funded</li> <li>Funding levels have been aligned to business requirements</li> <li>Funding levels enable the appropriate delivery date of key data initiatives</li> <li>Appropriate funding levels for sustained data operations have been approved</li> <li>All funding commitments have been reviewed and approved by relevant stakeholders</li> </ul>		<b><u>Advice</u></b>	This is the reality check of the funding model. The goal is to ensure that resources needed to deliver against objectives are available – and to ensure that the business requirements can be satisfied. It is important that the proposed funding model is evaluated by all stakeholders and that feedback is captured.		
		<b><u>Questions</u></b>	<ul style="list-style-type: none"> <li>Can the IT infrastructure deliver against requirements?</li> <li>Can the operations team sustain and support the objectives of the data management program?</li> <li>Is the funding model appropriate for the program?</li> <li>Has the funding model been socialized and approved?</li> </ul>		
		<b><u>Artifacts</u></b>	<ul style="list-style-type: none"> <li>Alignment of budget with business requirements and delivery schedules</li> <li>Alignment of data management goals with IT and operational capability</li> <li>Stakeholder lists and approvals</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no funding model for data management	The funding model for data management is under discussion	The funding model is proposed and socialized with program stakeholders. Feedback is collected and incorporated into the model	The data management funding model has been reviewed and approved by program stakeholders	The funding model is reviewed and enhanced as part of the annual funding process (to reflect evolving requirements)	

### 2.2.2. The DM funding model is aligned with the business process of the organization

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"><li>DM funding addresses current year budget cycle.</li><li>DM funding is mapped to a multi-year implementation plan.</li><li>Data management funding is integrated as a sustainable corporate function</li></ul>		<b><u>Advice</u></b>	The goal is to ensure that the funding model for data management is synchronized with the overall funding approach of the organization (i.e. budget processes, cycles, escalations, approvals). Successful programs leverage existing mechanisms because they are already established and enforceable.			
		<b><u>Questions</u></b>	<ul style="list-style-type: none"><li>Is the funding process being debated with stakeholders at the appropriate level of authority?</li><li>Is the funding model for the current year or does it span multiple years?</li></ul>			
		<b><u>Artifacts</u></b>	<ul style="list-style-type: none"><li>Alignment with budget processes and organizational cycles</li><li>Mapping to current and multi-year implementation plans</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced	
There is no alignment of the funding model with business processes	The relationship between the data management funding model and the organizational business processes is being debated	The alignment of the funding model with the business processes of the organization and discussions about the funding model type (centralized vs. federated) are under review by stakeholders	The data management funding model addresses current year budget cycle. Multi-year budget considerations are being finalized by program stakeholders	The data management funding model is mapped to a multi-year implementation plan	Data management funding is integrated into operations as a sustainable corporate function	

### 2.2.3. Implementation of the DM funding model is enforced.

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"><li>Funding is allocated and approved by the lines of business.</li><li>All budgets are reviewed and approved by the data management organization.</li><li>Data management organization is empowered to enforce the line of business data management funding allocation in accordance with data management program objectives</li></ul>		<u>Advice</u>	Funding for the data management program can't be optional. Enforcement can come from top-of-the-house. IT can come from a centralized "seed funding" approach. It can come from LOB management. Regardless – there needs to be evidence of financial support.			
		<u>Questions</u>	<ul style="list-style-type: none"><li>Is the funding enforcement approach documented and verified?</li><li>Are funding sponsors identified and confirmed?</li><li>How will the ODM handle budget "haircuts" or other funding challenges?</li><li>What is the process for prioritizing both discretionary and non-discretionary funding decisions?</li></ul>			
		<u>Artifacts</u>	<ul style="list-style-type: none"><li>Documented enforcement mechanism</li><li>Dependencies map to ensure funding</li><li>Communication with stakeholders</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced	
There is no enforcement process for data management funding	The methods and approaches for ensuring adequate funding for data management are under discussion	Funding is allocated and approved by the lines of business	Data related budgets are reviewed and approved by the data management organization	The data management organization is empowered to enforce data management funding allocation		

## 2.3. The funding model can be measured and evaluated against tangible business objectives

### 2.3.1. Total expense for the data management program is captured, maintained and analyzed

<p><i>Data and data management expenses occur throughout an organization and need to be assessed in the context of the overall data management program. Determining the current cost at the enterprise level as well as the line of business level establishes a benchmark that can be tracked and compared to as the enterprise data program is established and deployed.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Current-state data and data management expense is captured at the LOBs and enterprise levels</li> <li>Total expense is analyzed, maintained and used to establish a cost benchmark for comparison to future costs as the data management program is implemented</li> </ul>	<u>Advice</u>	It is important to establish a cost baseline for the data management program. This is an essential (and valuable) metric. Prepare for interactive discussions on the definition of expenses that constitute “data” as well as on the appropriate methodology to use to capture spend by category.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>What expenses constitute “data”?</li> <li>What methodology is used to capture spend (i.e. acquire, cleanse, store, manipulate, transform, integrate, distribute) as well as on soft metrics (reconciliation, lack of capability, missed opportunity, capital charges, inefficient operations, collateral calculations, etc.)</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Expense categories (evidence of agreement)</li> <li>Cost allocation methodology</li> <li>TCO calculation (worksheets, approvals, reporting, ROI criteria)</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no methodology for capturing expense associated with data management	The methodology for calculation of TCO is under discussion	The methodology for calculation of TCO is drafted and being reviewed by stakeholders	The methodology for calculating TCO for data management is verified by stakeholders	Total expense is captured, maintained and analyzed at both the line of business and organizational levels	

### 2.3.2. A standard methodology for capturing the financial benefits of the data management program is established

<p><i>Positive cost benefit analysis of the data management program is necessary to ensure organizational buy-in. Keep in mind that data management effects many systems and processes across the organization and may need to be evaluated beyond standard ROI (project based) methodologies.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• A standard methodology for calculating the financial benefits of the data management program at the line of business (either using an established organizational standard or creating a new method) is established</li> <li>• A standard methodology for calculating the financial benefits of the data management program is established to at the enterprise level for aggregate evaluation.</li> <li>• Relevant stakeholders review and approve cost/benefit methodology</li> </ul>	<u>Advice</u>	Capturing benefits is needed to ensure continued buy-in to the data management program. Benefits should be understood in the context of the entire organization (i.e. evaluate all the dependencies associated with trusted data). This will not usually fit into standard criteria for the calculation of (project-based) ROI. Find out what methodology is being used and how the calculations are determined. Think about the value proposition from four dimensions: (1) operational efficiency (cost), (2) trust (model-based strategies), (3) insight (upselling and predictive analysis), and (4) flexibility (ability to adapt to changing circumstances).
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• What is the organizational view of benefits associated with data management?</li> <li>• What are the methodologies used to calculate financial and operational benefits?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Documentation of methodologies (and illustrations of how applied)</li> <li>• Roster of stakeholders and evidence of bi-directional communication (and approvals)</li> <li>• Alignment with business case (did we deliver what we promised)</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no methodology for measuring the benefits of the data management program	The methodology for evaluation the return on investment associated with data management is being discussed	The approach for capturing the financial benefits of the data management program is being defined in collaboration with program stakeholders	The financial benefits of the data management program are being measured, monitored and used for LOB decision making	The financial benefits are being aggregated at the organizational level	

### 2.3.3. Financial benefits are measured, monitored and used for making data management program decisions

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Financial benefits are measured, monitored and used for LOB decision making.</li> <li>Financial benefits are aggregated at the organizational level and used to influence data management program priorities</li> </ul>		<u>Advice</u>	Evidence of value is extremely useful in reinforcing the contributions of the data management program. Capturing metrics for the purpose of informing is where the real value is realized. Ensure that captured metrics are being properly used for decision making, resources allocation, task prioritization, and other similar business objectives. Expressions using tools such as “heat maps” help put data management into context. The ability to “name and shame” is useful in helping to release purse strings.		
		<u>Questions</u>	<ul style="list-style-type: none"> <li>Are financial benefits measured, monitored and used?</li> <li>How have these metrics been used to establish and remediate priorities?</li> </ul>		
		<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Evidence of use of metrics to evaluate, adjust and enhance the data management program</li> <li>Distribution lists and evidence of bi-directional feedback</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Financial benefits of the data management program are not captured	The approach for capturing the financial benefits of the data program are being discussed	Methodology for capturing the financial benefits of the data program are being developed	The methodology for measuring the financial benefits of the data program have been defined, and have been shared with and verified by relevant stakeholders	The financial benefits are being aggregated at the organizational level and used to influence data management program	



## 3.0 DATA MANAGEMENT PROGRAM

### **Definition:**

A Data Management Program is an organizational function dedicated to the management of data as an asset throughout an organization. It illustrates how the management of data quality, definition and content supports strategic, business and operational objectives. It reinforces the necessity of orchestration, active collaboration and alignment among diverse stakeholders in order to instill confidence in data as a trusted factor of input into business and operational processes.

### **Purpose:**

The purpose of a Data Management Program is to embed the concepts of data management into the operational framework of an organization on a sustainable basis. The creation of the data management program elevates the importance of data content management and integrates it as a core component of organizational operations. It establishes data management as a sustainable activity and reinforces the importance of managing “data as meaning” across the organization.

### **Introduction:**

The concept of managing “data as meaning” is not always well understood. For many organizations, data is understood as something to process. It is acquired, normalized, stored, processed and integrated into applications. And while data processing is a critical function, data is also designed to be an accurate representation of real and meaningful things (*i.e. an obligation associated with a business deal, ingredients into a production process, identifying credentials of a customer, role performed in an organizational relationship, etc.*). The establishment of data management programs within organizations is designed to ensure the management of data as meaning and help orchestrate the alignment of data precision with data processing capabilities (the intersection of business and technology). These are complementary activities that should be viewed as the “factors of production” for information intensive organizations.

The data management program defines the key components that are needed to ensure trust and confidence in data content and provides guidance for its interaction across the organization. The function of data management is derived from an understanding of business objectives and organizational priorities as well as knowledge of how data flows from initiation through validation through enrichment through transformation and into consuming applications. In many environments, data content is understood as a manufactured product and flows through organization as part of a linked process. It is this linked nature of the process that highlights the collaborative components of data management. The goal is to instill a sense of collective ownership of data quality among all relevant stakeholders.

The data management program should be established as a formal, independent and sustainable part of the organization. The lines of responsibility and accountability need to be established. An inventory should be created to ensure the Office of Data Management has access to the appropriate staff resources and functional capabilities in order to deliver the data needed to support organizational objectives. An effective data management program has the strong support of executive management, appropriate governance authority to ensure the implementation of a control environment for data and a well-structured model of how stakeholders will engage on data-related issues. An effectively designed data management program that is flexible enough to accommodate to changing circumstances will help embed the importance of data content management into the culture of the organization.

**Goals:**

- Ensure that the Data Management Program is established, communicated and institutionalized as an independent and sustainable activity
- Ensure that the Data Management Program is staffed to provide sustainable operation
- Establish the role, responsibility, accountability and authority of the program stakeholders
- Establish the stakeholder engagement model to ensure consistency in day-to-day operations, interactions and decision making.
- Establish the structure and process to ensure that executive management support is institutionalized
- Define the organizational structure and process to ensure stakeholder's program adherence and adoption as well as conflict escalation and resolution.

**Core Questions:**

- Is the data management function aligned with the data management strategy and organizational objectives?
- Does our organization have the right mixture of skills, resources and capabilities to effectively implement and govern the data management function?
- Does the Data Management Program have the appropriate support from executive management?

## 3.0 Data Management Program

### 3.1. The data management program is established and empowered.

#### 3.1.1. The data management program is established

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Data management program is formally established within the organization</li> <li>Data management program is sanctioned by executive management.</li> <li>The role of the data management program is communicated across the firm through formal organizational channels</li> </ul>	<u>Advice</u>	The ODM should be established as an independent entity. Formalization is essential. Be careful about embedding in IT (implementation partner). The creation of a new control function needs a clear announcement from executive management and air cover for inevitable disruption. Support needs to be broad-based (i.e. if lone champion departs, will program survive).			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Has the data management program been formally established?</li> <li>Has the ODM been formally communicated to IT, business, operations, finance, risk?</li> <li>How has executive management demonstrated its support?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>ODM Charter (strategy and approach)</li> <li>Communication to stakeholders (with feedback)</li> <li>Definition of roles and responsibilities</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
The program has not been established	The function, structure and operational framework of the program are being discussed	The components of the program are being developed.	Stakeholder feedback is captured and	The program is established, sanctioned by executive management and socialized	

### 3.1.2. The data management program has the authority to enforce adherence and compliance.

<p><i>Data Management Program must be formally empowered by senior management and its role communicated to all relevant stakeholders.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Data Management Program is operating collaboratively with program stakeholders.</li> <li>• Data Management Program has the authority to enforce adherence and compliance through policy and documented procedure</li> </ul>	<u>Advice</u>	Creating the program without empowerment is useless. As a change function, the ODM needs authority to enforce behavioral change. The authority granted must be formal. Support from audit is very useful to ensure compliance with policy and standards
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Has the DMP been established as mandatory?</li> <li>• Has authority been granted to implement and enforce best practice via policy and standards?</li> <li>• Has authority been communicated?</li> <li>• Is there a functional partnership in place with audit?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Communication from executive management (and distribution lists)</li> <li>• Policies and procedures associated with making data management mandatory</li> <li>• Bi-directional engagement with stakeholders on ODM authority</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no mechanism for enforcing DMP program adherence	The strategies and approaches for ensuring adherence with (and compliance to) the DMP are being discussed	The policies and procedures associated with adherence are defined and shared with program stakeholders. Senior management is championing the program and defining the expected authority of the data office	Feedback is captured and incorporated into the DMP. The DMP is operating collaboratively with program stakeholders. Senior management is endorsing and managing communication about the objectives and authority of the DMP	The DMP has the authority to enforce adherence and compliance through policy and documented procedure	

## 3.2. The data management organizational structure is created and implemented

### 3.2.1. Data management office (DMO) is created

<p><i>The DMO refers to the centralized organization responsible for championing the data program.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• DMO is designed and planned.</li> <li>• DMO is chartered and approved.</li> <li>• DMO is created</li> </ul>	<u>Advice</u>		The data management office formalizes and runs the data program. The DMO needs visible and strong commitment from executive management. A formal (official) office is necessary to create policy, implement standards, coordinate governance, run interference across control functions and manage organizational collaboration.		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>• Is there a formal and sanctioned Office of Data Management?</li> <li>• Is it recognized as part of the official corporate structure?</li> <li>• Does the ODM have the authority it needs to implement change?</li> <li>• Does it have a clear mission and charter?</li> <li>• Does the ODM have strong (and visible) executive support?</li> <li>• Does the ODM have sufficient funding and the skill sets needed to accomplish the data management objective?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>• Data management charter and approvals</li> <li>• Specific and identifiable organizational structure</li> <li>• Formal communication from executive management (notification to stakeholders of function and authority)</li> <li>• Bi-directional communication and feedback from stakeholders</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
DMO doesn't exist	The concept of a data management organization is under discussion	The data management organization is being developed	The data management organization has been designed and chartered and has been approved by relevant stakeholders	The data management organization is operational	

### 3.2.2. The DMO has an executive owner

<p><i>A senior executive (ex: Chief Data Officer) must be appointed and be given full authority to run the DMO. The role and scope of responsibility of this position must be clearly defined and communicated to the organization.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Need for executive owner is recognized, socialized and communicated.</li> <li>• The role and responsibility of the chief data executive is clearly defined and communicated</li> </ul>	<u>Advice</u>		A single (executive) throat to choke is essential. The data management program cannot be run by committee. To ensure that the data management program is sustainable, a senior executive with authority and executive support must be appointed. The executive in charge needs to be the visible advocate for data management (with vision and passion), chief diplomat for collaboration as well as person that runs the program. Simply appointing the executive is not sufficient. The role and authority necessary to implement change of this magnitude needs to be communicated to all stakeholders.		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>• Has the function of the CDO (executive) been defined, socialized and documented?</li> <li>• Has a senior executive/CDO been hired to run the data management program?</li> <li>• Has the executive been empowered with the authority necessary to implement the program?</li> <li>• Have the lines of authority for the CDO been defined and established?</li> </ul>		

<ul style="list-style-type: none"><li>Executive owner is hired or appointed.</li><li>Duties and authority of the executive owner have been communicated to all relevant stakeholders</li></ul>		<ul style="list-style-type: none"><li>Has the role of the DMP and the CDO been sanctioned and communicated to stakeholders?</li></ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"><li>CDO job definition (skills and expectations)</li><li>Named individual performing the data management executive function</li><li>Executive management communication to stakeholders (strategy for visibility)</li><li>List of stakeholders for communication about CDO</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data management is performed by individuals (heroes)	The need for an executive owner is recognized	The concept of an executive owner is being socialized with key stakeholders	The organization is actively seeking to hire the CDO (or equivalent)	The CDO is hired and the duties and authority of the executive owner has been communicated to all involved stakeholders	The CDO is an organizational peer with dotted line relationships to the other control functions (i.e. CTO, CIO and CFO)

### 3.2.3. The DMO is funded and staffed with the required skill-sets

<p><i>The DMO is appropriately funded and staffed with the required data management skill-sets</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Funding for the DMO is approved</li> <li>Approval to hire is granted</li> </ul>	<u>Advice</u>	<p>Be wary of data management programs that are approved but not given the authority to hire (or acquire) operational talent. It is not necessary for the ODM to “own” staff for all of the tasks associated with data management. Whether it exists as a stand-alone group or whether many of the operational functions are embedded into the business (with a small central coordination function) is dependent on the strategy and culture of the firm. Regardless, the data management program needs dedicated resources with appropriate skill sets. Finding the right people (and managing inevitable turnover) requires ramp-up time and contingency plans. Be careful about “single points of failure” and the creation of operational bottlenecks.</p>			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Is the operating model for the ODM established?</li> <li>Are the resources needed to support the program defined and acquired?</li> <li>Does the ODM have the authority to hire (or approval to acquire) the skill sets needed for implementation?</li> <li>Has ramp-up time for staff onboarding and funding commitment been anticipated?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Operating model (and resource plan) for the ODM</li> <li>Job descriptions for the defined organizational structure</li> <li>Gap analysis of skills needed/in place</li> <li>Confirmation of approved budget and authorization to hire</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
The data management organization is not funded	Funding for the data management organization is being discussed. Required skill-sets are being defined	Data management organization funding is in process. Skill-set recruitment (internally and/or externally) is in process	The data management organization funding is approved. Required skill-sets have been identified. Hiring is taking place	The data management is funded and staffed	

### 3.3. The roadmaps for the data management program are developed, socialized and approved.

#### 3.3.1. Program roadmaps are defined, developed and aligned with the data management strategy

<p><i>Program roadmaps define “target state”, and describe the steps required to attain. Roadmap topics include, but are not limited to governance structure; content management strategy; infrastructure design; data architecture; etc.</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"><li>• Program roadmaps are developed.</li><li>• Program roadmaps are aligned to all components of the data management strategy</li></ul>	<p><u>Advice</u></p> <p>Defined and detailed program roadmaps are needed to establish and communicate the pathway to the target state objective. Roadmaps need to be consistent with strategy. This is the guide for implementation. They don’t have to be fully fleshed out – but do need clear and tangible definition of what will be done (by when). Short term roadmaps (i.e. 30/60/90 day plans) do need to be comprehensive. More flexibility is OK for longer term plans. Questions should be raised about scope, practicality and achievability. Find out what type of dependencies are associated with the roadmaps. Dependencies add risk.</p>				
	<p><u>Questions</u></p> <ul style="list-style-type: none"><li>• Have clearly defined program roadmaps been developed?</li><li>• Are roadmaps and plans tangible (i.e. can they be measured)?</li><li>• Have the dependencies been defined, documented and verified?</li><li>• Are any/all dependencies included in respective budgets?</li></ul>				
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"><li>• Program roadmaps (including evidence on how they align to data management strategy)</li><li>• Maps of dependencies associated with implementation</li><li>• Outcomes and projected deliverables</li><li>• Budget alignment with roadmaps, plans and dependencies</li></ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no target state roadmaps for the DMP	Target state objectives and their implications on program roadmaps are being discussed	Target state objectives have been defined. Roadmaps being developed, aligned to data management strategy	DMP roadmaps are harmonized and aligned with data management strategy. The alignment is documented and verified by stakeholders.	Program roadmaps are fully defined and developed and are aligned to the data management strategy. The relationship between program roadmaps and data management strategy is approved	

#### 3.3.2. Program roadmaps are socialized and agreed to by program stakeholders

<p><i>It is essential that roadmaps are shared with relevant stakeholders. Working with stakeholders during the development phases invites collaborative feedback and buy-in.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Data management program roadmaps are shared with and aligned to the roadmaps of the program stakeholders (i.e.: architecture; technology;</li> </ul>	<p><u>Advice</u></p> <p>Sharing the program plans with stakeholders helps ensure support. This will require discussion and (likely) modification of plans. The back and forth collaboration is essential if you want stakeholders to own the outcomes, deliverables and commitments.</p>	
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>Have the roadmaps been shared with key stakeholders?</li> <li>Has feedback (including suggestions and concerns) been captured and addressed?</li> <li>Have final (agreed to) roadmaps been developed?</li> </ul>	
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>Distribution lists</li> </ul>	

operational roadmaps etc.).		<ul style="list-style-type: none"> <li>Stakeholders verify and approve data management program roadmap alignment</li> <li>Evidence of bi-directional communication with LOB (feedback, suggestions and concerns)</li> <li>Verification and approval of roadmaps</li> <li>Alignment of roadmaps with data management strategy</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Roadmaps have not been shared and socialized with program stakeholders.	Target state program roadmaps are being developed. Relevant stakeholders are identified	Program roadmaps are defined in collaboration with program stakeholders. Program roadmaps are shared with relevant stakeholders. Feedback is collected.	Program roadmaps are drafted and verified by program stakeholders. Stakeholder feedback is incorporated into the final version of the program roadmaps.	Stakeholders approve the DMP alignment	

### 3.3.3. Project plans are developed detailing deliverables, timelines and milestones

<p><i>Once roadmaps are agreed to and approved, they must be translated into tangible mechanisms for delivery. The Data management program office is responsible for the creation, coordination and management of the data management project plans.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Project plans are developed and aligned to program implementation roadmaps.</li> <li>Routine program review procedures are in place to track progress of development plans</li> </ul>	<u>Advice</u>	Program roadmaps need to be translated into detailed project plans. The management of these project plans should be centralized (via an established PMO) to ensure adherence and delivery. The project plans need to contain practical deliverables and reflect the priorities that were negotiated with stakeholders. They must be in alignment with approved budgets.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Do practical project plans exist?</li> <li>Are they aligned with program roadmaps and budgets?</li> <li>Is there a centralized mechanism (PMO) in place to oversee implementation?</li> <li>Are routine project review procedures in place to track progress?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Evidence of completed project plans with defined deliverables</li> <li>Timeframes and milestones in line with implementation roadmaps</li> <li>Centralized program management office</li> <li>Program review procedures to track progress</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no project plans for the DMP	Project plans are in the process of being defined	Project plans are defined in collaboration with program stakeholders	Project plans are drafted and verified by program stakeholders	Project plans are developed and aligned to program implementation roadmaps. Routine program review procedures are in place to track progress of development plans	



### 3.4. Stakeholder engagement is established and confirmed

#### 3.4.1. Identified stakeholders commit and are held accountable to the data management program deliverables

<p><i>Data management requires participation and cooperation from staff and resources outside the data management program organizational structure, as well as staff and resources from other firm-wide control functions. Those identified as relevant stakeholders must be held accountable for on time and on budget project delivery. To strengthen that commitment, performance in support of the data management program should reflect in stakeholder reviews and/or compensation.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Roadmaps and program milestones have been communicated to the program stakeholders.</li> <li>Program stakeholders have reviewed program deliverables.</li> <li>Stakeholders are in agreement with (and are being held accountable) to program deliverables.</li> <li>Program stakeholders are committed to the program deliverables through job description modification and/or through compensation/bonus</li> </ul>	<p><u>Advice</u></p> <p>Data management is a collaborative activity. It has implications across the organization and affects multiple stakeholders. Ensuring that data is properly curated, secure and accessible is a shared responsibility. Commitment from stakeholders is an essential component of a successful data management program and comes in many forms. It involves financial commitment. It involves operational (frequently daily) commitment. It involves performance commitment. It requires accountability. You are looking for evidence of these types of behaviors.</p>
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>Have stakeholders been identified and verified?</li> <li>Have stakeholders demonstrated commitment to the objectives of the DMP?</li> <li>Is funding in place to verify commitment to DMP deliverables?</li> <li>Is there a mechanism to ensure accountability (i.e. alignment with performance review and compensation)?</li> </ul>
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>Roster of stakeholders</li> <li>Documentation of commitment/deliverables (incremental, milestone and final)</li> <li>Evidence of bi-directional feedback and approvals</li> <li>Mechanisms to ensure accountability (i.e. modification of job descriptions or performance review criteria)</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no mechanisms for holding stakeholders accountable to DMP deliverables	DMP objectives are in the process of being translated into program deliverables Stakeholders impacted by the program objectives and deliverables are being identified	Program stakeholders are identified and verified. Program deliverables are defined in collaboration with involved stakeholders Program deliverables are being reviewed with relevant stakeholders. Feedback is collected.	Program deliverables have been reviewed and verified by stakeholders	Stakeholders have committed to program deliverables and timelines, supported by their management. Stakeholders are being held accountable to program deliverables	Program deliverables are implemented via job description modification and reflected in compensation

### 3.4.2. Resource plans are aligned with and verified against program requirements

<p><i>Proper resource levels with appropriate skillsets must be secured by relevant stakeholders</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Resource planning is complete</li> <li>• Resource plans have been reviewed, reconciled and approved by the data management PMO</li> <li>• Approved resources are in place</li> </ul>					
		<u>Advice</u>	<p>The goal is to ensure that resource plans are sufficient to support the program deliverables, timelines and commitments. Resource allocation plans must be verified and approved. Be aware of the “risk of haircuts.” Data management is collaborative and cuts/inadequacies can have a cascading effect. Make sure the commitments are strong.</p>		
		<u>Questions</u>	<ul style="list-style-type: none"> <li>• Have stakeholders pledged sufficient resources to implement project plans and meet program roadmaps?</li> <li>• Do the resources exist or do they need to be acquired?</li> <li>• If they need to be acquired, has sufficient ramp up time been incorporated into deliverable timeframes?</li> <li>• Does the ODM have authority to review and modify resource plans of stakeholders?</li> </ul>		
		<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Resource plans and documents</li> <li>• Processes to review, modify and validate resource plans</li> <li>• Bi-directional feedback (review, reconcile, approve)</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Resource planning for the DMP is not formalized	Resource plans needed to support the DMP are being defined in collaboration with program stakeholders	Stakeholders prepare resource plans to support the data management program	Resource plans have been reviewed by the data management PMO. Challenges have been reconciled	DMP resourcing plans have been approved	

### 3.4.3. Funds are allocated and aligned to program roadmaps and workstreams

*Sufficient funding dedicated to the data management program must be committed to by business, technology and operations. In a mature data management program, the data management office (or the equivalent) is granted authority to review and approve committed budgets.*

#### **Sub-Capability Objectives**

- Funding has been allocated and aligned to the program roadmaps and workstreams.
- Funding allocations have been reviewed by the data management PMO.
- Funding challenges have been discussed and reconciled.
- Funding levels have been approved and allocated

#### **Advice**

Funding plans have dependencies and interrelationships. The goal is to ensure that all stakeholder plans are approved and aligned with the objectives of the DMP. There is no single strategy for funding data management initiatives. The strategy will depend on the culture of the firm. Some fund centrally. Some require LOB allocations. Some provide seed funding for early stage activity. Some mix and match. Regardless of the funding mechanism(s) – accountability and predictability are required – and the ODM needs some mechanism to ensure funding commitment.

#### **Questions**

- Have budgets been prioritized to ensure adequate funding for the DMP?
- Are budgets aligned to program deliverables?
- Does the ODM have the authority to challenge stakeholders about budget commitments?

#### **Artifacts**

- Funding plans and budget allocation
- Funding approval and authorization to spend
- Escalation procedures for budget shortfalls

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Funding for the DMP is not formalized	The funding required to support the DMP is being defined in collaboration with program stakeholders	Stakeholders prepare funding to support the data management program. Funding is aligned to program roadmaps and workstreams	Funding allocations have been reviewed by the data management PMO. Challenges have been reconciled	Funding levels have been approved and allocated	

### 3.5. Communication program is designed and operational

#### 3.5.1. Internal communication plans have been created, channels established, plans published and approved

<p><i>Plans for internal communications are needed to drive awareness and adherence to the data management program. The full spectrum of communications channels (i.e. websites, access portals, reference libraries, documents, training materials, town hall meetings, etc.) are needed to ensure that stakeholders understand the goals, objectives and processes associated with the data management program</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Internal communication plans have been developed, shared and approved by relevant stakeholders</li> <li>Communication channels are established.</li> <li>Communication program is implemented and operational</li> </ul>	<p><u>Advice</u></p> <p>Take advantage of the internal communications infrastructure to develop and implement a firm-wide communications strategy. Communications needs a formal plan and should use all available media (written communication, internal websites, road shows, town-hall meetings, etc.) It is important to evaluate the degree to which executive management is participating in these activities. Their engagement denotes importance and sends a clear/positive message of support for data programs.</p>				
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>Have the plans been created, published and approved?</li> <li>Are the communications channels defined and established?</li> <li>Is the internal communications program operational?</li> </ul>				
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>Communications plan and channels to be used</li> <li>List of stakeholders (bi-directional feedback and approvals)</li> <li>Evidence/illustration of methods used (and content of)</li> </ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no communications strategy about the data management program	DMP communication requirements and plans are being defined	Communication plans have been defined and shared with involved stakeholders	DMP communication plans have been verified and approved by program stakeholders	DMP communications strategy is implemented and operational	

### 3.5.2. Communication plans with external regulators bodies are created and approved

*This is for organizations subject to regulatory oversight. Communication with regulators and government authorities are essential as well as functional. The regulatory mandate for data management can be an important component of the overall data management program*

#### **Sub-Capability Objectives**

- Proactive communications strategy, with relevant regulatory bodies, is planned and approved by program stakeholders.
- Procedure for regulatory communications is established (in most organizations, this is done through the firm's compliance department)
- Routine communications with regulatory bodies are taking place

#### **Advice**

Communication with regulators about data challenges and objectives should be proactive and transparent. Regulators are aware of the challenges of implementing a control environment. They have a stake in the matter as well (both market structure oversight and linked risk analysis). Self-identified data challenges and plans for remediation are much wiser than regulatory discovered data challenges with audit issues (MRA) written against the firm.

#### **Questions**

- Does the firm have a regulatory communication strategy?
- Has the strategy been developed in conjunction with compliance and risk (first line of engagement)?
- Are routine communications with regulatory bodies taking place?

#### **Artifacts**

- Regulatory roster (and evidence of communication)
- Internal approval process for regulatory engagement (procedure for regulatory communication)
- Self-identified audit reports

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no formal process for communicating the data management program to regulatory bodies.	DMP communication plan is being defined	Communications plan is being defined and shared with involved stakeholders	Communications channels are established and verified by stakeholders. Regulatory bodies have been contacted (if required) and plans for regular review are being planned.	Communications about the DMP are being delivered to program stakeholders. Strategy and plans for communication with regulators and market authorities (if required) are in place	-

### 3.5.3. Active engagement with external industry and standards bodies are in place

<p><i>Engagement with industry trade organizations, research consortia and standards bodies ensure that the organization is aware of and aligned with the latest trends associated with data management and new developments related to the data management best practice</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Stakeholders are kept abreast of changes and events in the data management industry.</li> <li>A formal function is established with dedicated resources to actively participate in data management industry activities and events</li> </ul>	<u>Advice</u>		Participation in industry organizations (new developments) and standards bodies (standards) need to be formalized. Internal owners and facilitation agents are a good way of ensuring the flow of information across the firm. Embedding engagement with external organizations and standards bodies into job descriptions is useful for clearing participation.		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>Do you have a strategy for engagement with the data management industry outside of your organization?</li> <li>Are the appropriate owners and facilitation agents identified and engaged?</li> <li>Does executive management understand the value proposition and buy-into the engagement activity?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>Evidence of participation and contribution (events, working groups, resources)</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no plans for engagement with industry groups or standards bodies.	The value and importance of engagement with industry and standards organizations is being discussed.	Relevant industry associations are being identified.	The process for engagement with external bodies is being developed.	Active engagement with external industry bodies is established and part of the "operate model."	

### 3.6. Data management routines are established, operational and measured

#### 3.6.1. Routines for support of the data management program have been established

<p><i>Routines for steady-state operations of the data management program are taking place. Routines include but are not limited to regular stakeholder meetings, planning sessions, status reporting, etc.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Program routines required for operational support have been identified and scheduled.</li> <li>• Program routines, meetings and working sessions are taking place</li> </ul>	<p><u>Advice</u></p> <p>To state the obvious – plans and PowerPoint presentations are great, but unless there is evidence of activity being done on a routine basis, the likelihood of a sustained program is at risk. Routines in the form of standing meetings (with high repeatable attendance), planning sessions and regular communications help ensure that data management objectives are taking place. Ask stakeholders if they are “routinely involved” in data activities and if they are receiving regular communication about data management initiatives.</p>				
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>• Are data management activities part of the normal operational routine of stakeholders?</li> <li>• Are there standing meetings, planning sessions and regular communications about data initiatives?</li> </ul>				
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>• Meeting minutes, status reports and data management program announcements</li> </ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no established routines to support the DMP	Program routine needed for operational support of the DMP are being discussed	Program routines needed for operational support of the DMP are identified	Program routines needed for operational support of the DMP are scheduled	Program routines, meetings and working sessions are taking place	

### 3.6.2. Issue identification, prioritization, escalation and conflict resolution are defined and operational

<p><i>An established escalation process is necessary to resolve conflicts, reconcile priorities and ensure efficient operations. It demonstrates improved service to the organization, promotes the benefits of an established data management program, and is an important operational routine expected of audit and regulatory reviews</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Issue Management routines (meetings; check points; etc.) are defined.</li> <li>Issue Management routines are documented and operational</li> </ul>	<u>Advice</u>		An established escalation process is necessary to resolve conflicts, reconcile priorities and ensure efficient operations. These escalation and mitigation procedures need to be formalized with clearly established roles and responsibilities as well as defined decision points.		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>Do escalation procedures exist for data management issues?</li> <li>Are the right people with the appropriate levels of authority involved in the decision-making process?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>Escalation procedures and communication about conflict resolution</li> <li>Evidence of implementation (documented escalation lineage)</li> <li>Issue log, KRIs and other performance metrics</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no established procedures for conflict resolution	Escalation procedures for conflict and prioritization resolution are being discussed	Escalation procedures for conflict and prioritization resolution are identified	Escalation procedures for conflict and prioritization resolution are defined and verified by stakeholders	Escalation procedures for conflict and prioritization resolution are documented and operational	



### 3.6.3. Metrics (i.e.: KPIs, KRIs) are defined and used to track program progress

<p><i>It is important to develop and use various metrics to track the progress in the implementation and adoption of the data management program. Program elements such as organizational rollout (organizational structures; skill-set hiring; leader appointments, etc.), financials, ROI, policy adoption, standards implementation, data quality improvement, are all critical metrics that demonstrate the health and wellness of the data management program.</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"> <li>• Program tracking metrics have been designed.</li> <li>• Program tracking metrics are being captured and reported.</li> <li>• Program metrics are being analyzed and incorporated into program modifications</li> </ul>	<u>Advice</u>		This is the implementation of metrics at the data management program level. It is important to track progress (and adoption) of the program in order to give stakeholders confidence that the DMP is making progress and to keep pressure on the DMO for implementation of their program responsibilities.		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>• Have the metrics for evaluating data management program progress been established, verified and approved?</li> <li>• Are they being captured and used?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>• Metrics list and reports (evidence of use)</li> <li>• Distribution lists and evidence of bi-directional communication/feedback</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Metrics for the Data Management Program have not been defined	The importance (and types) of metrics are being discussed.	Metrics for various elements of the data management program are being identified and defined.	Metrics are being developed in collaboration with program stakeholders	Program metrics are defined, captured, tracked and reported.	Metrics are being analyzed and used to modify the data management program

## 4.0 DATA GOVERNANCE

### **Definition:**

Data Governance is the backbone of a successful Data Management Program. Data Governance is the process of setting standards, defining rules, establishing policy and implementing oversight to ensure adherence to data management best practices. Governance is the formalization and empowerment of the Program to ensure propagation and sustainability throughout the organization.

### **Purpose:**

The purpose of Data Governance is to formalize Data Management as an established business function. Data Governance establishes the rules of engagement, drives funding and prioritization, enforces compliance. Data Governance defines the guidelines for data movement, which defines how data will be acquired, persisted, distributed, appropriately used, archived and/or defensibly destroyed. Data Governance defines oversight by establishing control guidelines, approval processes and evaluation of adherence to policies and procedures. Data Governance ensures that data management principles are fully defined, stakeholders are identified and empowered and adoption is achieved. Governance also ensures that technology, business and operations functions are held responsible and accountable for the maintenance, quality and proper use of data throughout the organization.

### **Introduction:**

Governance is the key to successful data management. It establishes lines of authority and ensures that the principles of data management can and will be implemented. It establishes the mechanisms for stakeholder collaboration and defines the organizational structure by which the data program will be managed. The governance infrastructure determines where the program resides in the corporate hierarchy, helps manage stakeholder expectations, ensures the adoption of policies and standards, articulates the mechanism for conflict resolution, ensures adequate funding and sets the methodology for measuring data management progress.

Governance over the data management program is multidimensional and includes activities related to strategy, operations, data architecture, IT implementation, data quality and procurement. It is not created as a steady state activity but will mature and evolve over time. And while the most appropriate structure will vary across organizations, a clear mission with links to tangible business objectives as well as a mechanism for realignment is essential for long term success. For example, domain councils might exist to oversee the intersection of business, technology, and operations. Governing boards might be created to establish business data priorities and resolve conflicts. Tactical groups might exist to manage workflow, perform data reconciliation, address quality of critical data attributes, perform business analysis and provide triage to resolve pressing business challenges with data. All of these components need to be linked into an overall framework if governance is going to successfully embed data management concepts into the culture of the organization as well as manage implementation.

The organizational model for data governance establishes the mechanism by which the data management program is managed, funded and implemented. It defines the management hierarchy and accountability structures for the data program including how people and processes interact. The key objectives are to ensure that the principles of data management are defined and adopted across the organization; that the mechanisms are in place to ensure sustainable funding; and that stakeholders are aligned on the collaborative nature of data management. Executive sponsors are essential to ensure that data governance is successful. Sponsors need to be engaged in both the objectives and structure of the data management

program from its inception. The executive mandate helps establish shared expectations and promotes confidence that program objectives are a high priority despite any disruption created to business priorities and operational structures. Executive sponsors have a critical and active role in managing expectations and in establishing a functional mechanism for addressing competing priorities.

In order to implement governance, the organization needs to ensure that the deployment plan will be effective within their business environment. The governance structure can be used to prevent attempts to “boil the ocean,” provide a mechanism to limit selling of obscure technical concepts that don’t mean anything to business users, help avoid finger pointing, and minimize environments where stakeholders are put on the defensive. After the initial implementation, the governance framework itself needs to be evaluated, measured and adjusted based on business reality and to ensure that it is fully integrated into operations.

One of the core functions of data governance is to manage the staffing requirements needed to implement the processes and technologies associated with sustainable data management. This should be accompanied by a formal inventory of resource requirements and aligned with the data lifecycle. And since it is not always necessary (or possible) for all essential staff resources to be “owned” by the data management organization, governance is needed to implement the strategy for resource sharing. Resourcing for data management combines IT knowledge, business experience, and data management expertise. The goal is to align skill sets with resources to identify “natural” candidates for new data roles.

The components of data management governance also need to be closely aligned with criteria for measuring the value of data management against defined objectives. Measurement criteria can be used to evaluate the gap between actual and expected value (disparity); the relationship between data management variables (correlation) and the measurement of the data program against objectives (performance). These can be translated into practical measurement criteria such as the cost of correcting mismatches, the time spent on data reconciliation, opportunities for systems consolidation, reduction in the number of transformations, responsiveness to customers, acceleration of business, reduction in operational risk, etc.

### *Standing Up Your Governance Program*

Although this may differ from organization to organization, there are generally 4 steps that are needed in order to establish an effective data management governance program.

1. *Establish the governance structure:*

The aim of the governance structure is to identify and organize the critical stakeholders and link them to the necessary data management support components. In order to implement governance, the organization needs a formal deployment plan to ensure that the governance structure, organizational model, and oversight mechanism will work within the business environment. Interacting with executive management to ensure that adequate funding for data management is in place is critical to ensure that governance is successful.

2. *Implement policy & standards*

Formalizing policy is the foundation for Data Governance.

- Policy addresses how data is gathered, maintained, delivered and utilized. For policy to be effective, it must be enforced and made auditable across the enterprise. Effective policy is driven by the data management organization in collaboration with technology and business.
- Standards address uniform data alignment to common meaning, structure and identification. Firms can align to internal standards (i.e.: for expediency or when industry-wide stan

dards are not mature) and/or to external standards for broad comparability across many participants. Standards are often defined and driven by technology and business subject matter experts, coordinated through the data management offices

3. *Develop the operate model:*

The operate model must be implemented and deployed to ensure that the data management principles are fully defined, adopted and adhered. The model provides guidance for managing the structure and activities of the data governance program. The model defines the controls, checkpoints and tollgates required, and establishes formal approval processes for the program.

4. *Monitor and measure:*

Formal process for adequately monitoring and measuring the effectiveness of the data management program must be deployed to ensure the program is meeting its stated objectives. The program must be evaluated to ensure ongoing consistency with organization policy, and alignment with business strategy. Continuously measuring the program is essential. Metrics-based measurement criteria should be developed and used to track the progress and health of the program. Measurement criteria can include areas such as: measurement of compliance to policy and standards; the cost of correcting mismatches on trade repairs, the time spent on reconciliation, consolidation and better use of existing data sources, reduction in the number of transformations, consolidation of redundant systems, responsiveness to customers, acceleration of business, operational risk, etc.

**Goals:**

- Establish executive sponsorship for the program. Communicate purpose and objectives.
- Establish a functional data management organizational structure with clear role definitions, responsibilities, and accountabilities for data management resources.
- Establish governance implementation procedures to ensure compliance with policies, processes, standards and resources. Ensure that the structure provides for program oversight, policy enforcement, and issue escalation.
- Develop comprehensive and achievable policies and procedures.
- Define clear lines of authority and responsibility for decision-making as well as mechanisms for enforcement of data management based on operational constraints.
- Ensure that appropriate resources have been allocated to ensure that data governance is effectively implemented.
- Develop and implement a uniform process for establishing a comprehensive set of metrics. Ensure stakeholder collaboration in the development and use of metrics for meeting data management measurement criteria.
- Formalize consistent reporting of metrics to identify the progress, health and benefits of the data management program.

**Core Questions:**

- Have the data management policies been defined, developed and validated with key stakeholders?

- Has a governance structure been established? (Stakeholders identified; charters written; responsibilities assigned, etc.)
- Are there mechanisms in place for issue escalation and resolution?
- Are there mechanisms in place for establishing and resolving prioritization issues among stakeholders?
- Are the appropriate executives identified and engaged?
- Has the methodology to ensure compliance with established policies, processes and standards across the full data lifecycle been defined?
- Is the funding model and resource strategy sufficient to support the objectives of the data management program?
- Have the metrics been validated by stakeholder criteria, aligned with business objectives and collected in a timely manner?
- Are the metrics specific and achievable (actionable) within your organization to improve data management and meet objectives?

## 4.0 Data Governance

### 4.1. Data governance structure is created.

#### 4.1.1. Data governance function is created

*The data governance function is established to ensure the creation and enforcement of data program policy, standards and overall governance control environment*

##### **Sub-Capability Objectives**

- Data governance function is designed and planned.
- Data governance function is chartered and approved.
- The responsibility of the data governance office is communicated and endorsed by relevant stakeholders

##### **Advice**

Data governance requires planning, coordination and the allocation of dedicated resources. Make sure the timing associated with the establishment of governance is appropriate. Programs fail if governance structure is established before there is clear agreement on what is being governed and why. Governance follows the establishment of the program and engagement with the business on data challenges, goals, and obstacles. The governance function will succeed if the executive champions (with the right levels of seniority) are fully engaged. Allow for a “burn-in” period. Creating and enforcing new policies, procedures and standards which change the way stakeholders operate need to allow time for behavioral and operational adjustment. Active collaboration with audit (or equivalent function) will help reinforce appropriate behavior.

##### **Questions**

- Are the executive champions for the data program fully engaged in the data initiative?
- Do stakeholders understand (and buy-into) the objectives of the data management program and the role of governance in ensuring compliance?
- Is the implementation schedule associated with data management aligned with operational reality?
- Is there sufficient authority behind the policies, procedures and standards to ensure compliance by business and operational stakeholders?

##### **Artifacts**

- Data governance charter and objectives
- Roster of stakeholders
- Bi-directional communication about the data management program (including compliance expectations and schedules)
- Approvals and authorizations needed for implementation

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data governance does not exist	The concept of a data governance function is under discussion	A data governance function is being designed, planned and developed.	The data governance function has been chartered and approved, and has been socialized to and approved by relevant stakeholders.	Data governance function is operational	

#### 4.1.2. The data governance plan is created

<p><i>A comprehensive governance plan needs to be built in collaboration with critical stakeholders</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"><li>• The roles and responsibilities of data governance is defined and articulated</li><li>• Data governance plan is drafted and aligned to operational objectives, priorities and culture.</li><li>• Data governance plan has been shared with relevant stakeholders.</li><li>• Data governance plan has been reviewed and feedback has been incorporated into the final version.</li><li>• Data governance plan is approved</li></ul>		<p><u>Advice</u></p> <p>The plan is designed to be the expression of all the components of governance. It defines the governance mechanisms, identifies the key stakeholders, outlines the review/approval process and helps ensure alignment across the organization. The plan is the governance sales document. Don't put this forward pre-maturely. Policies and procedures associated with the governance process must be practical if the program is to be credible. Stakeholders need to understand the governance concepts and accept the implications. Management support is essential.</p>			
		<p><u>Questions</u></p> <ul style="list-style-type: none"><li>• Have the critical elements of the governance plan been defined?</li><li>• Have the appropriate stakeholders been identified and engaged?</li><li>• Are the roles, responsibilities and program elements defined?</li><li>• Has the governance plan been tested against business and operational reality?</li></ul>			
		<p><u>Artifacts</u></p> <ul style="list-style-type: none"><li>• The governance plan (including roles, responsibilities and procedures)</li><li>• Alignment of governance plan to data strategy and to internal processes (measure of practicality)</li><li>• Roster of stakeholders</li><li>• Visio Diagrams, charters, minutes</li><li>• Bi-directional communication with stakeholders (and feedback)</li><li>• Approvals and agreements from stakeholders</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no governance plan	The components of data governance are being debated	Data governance objectives are the subject of internal meetings among involved stakeholders	Active discussions with executive stakeholders on the requirements, roles and responsibilities associated with data governance are underway. A governance plan is being drafted and feedback is solicited	The governance plan exists. It is aligned with organizational objectives and priorities. It has been shared with involved stakeholders and approved by executive management	

#### 4.1.3. Program Office (PMO) is established and staffed with required skill sets

*The data program will require the coordination of many projects across a firm or division. Resources may be shared. It is important that a PMO is established and appropriately staffed with adequate resources to manage the required workload of the data program. The authority and responsibility of the PMO must be defined and communicated to all relevant stakeholders.*

##### **Sub-Capability Objectives**

- PMO is approved and chartered.
- The roles and responsibilities of the PMO are defined and communicated
- PMO is funded and staffed.
- PMO is authorized to ensure and enforce alignment of projects to data management policy and standards

##### Advice

Data management is no different from any other organizational function. It requires coordination. Program coordination must be formalized, appropriately staffed and empowered to ensure alignment among the stakeholders and adherence to program deliverables. Without the function of the PMO, data management is just another “good idea” that doesn’t get properly implemented (on time and within budget). Management of the details associated with implementation of the data management program is one of the real measures of implementation success.

##### Questions

- Does the function of the PMO exist?
- Is the PMO appropriately staffed and funded?
- Does the PMO have the authority needed to be effective?
- Have the roles and responsibilities of the PMO been defined, documented and socialized?
- Have milestones, metrics and measurements associated with program delivery been established?

##### Artifacts

- Evidence of PMO formation (i.e. charter and approvals)
- Description of roles and responsibilities of the governance program
- Staff assignments and qualifications
- Gap analysis of skills needed and in place
- Bi-directional communication to stakeholders (empowerment)

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no program management office	The need for a PMO for building the data management program is recognized - initial plans are being discussed.	The need for a PMO is recognized. Some formal project coordination is underway within individual lines of business. The roles and responsibilities of the PMO are being defined and communicated.	The PMO is approved and being implemented. Skill sets required for sustainability are being defined. Funding requirements and resource sharing plans are in process for approval	The PMO is chartered, staffed with required skill sets. The PMO is authorized to ensure and enforce alignment of projects to policies, procedures and standards	



#### 4.1.4. Enterprise governance structure is designed and implemented

*Enterprise governance structure refers to the organizational construct across the enterprise. Individuals must be appointed in business lines and control functions and given the responsibility of data management within those verticals, preferably, reporting into the COO or business leader within that group*

##### **Sub-Capability Objectives**

- Governance structure has been defined, documented and shared with relevant stakeholders.
- Organizational governance structures have been implemented.
- Working committees are established with written and approved charters.
- Stakeholders have been appointed.
- Stakeholder roles and responsibilities have been communicated.
- Stakeholders are held accountable for their participation in the data management program (i.e. via performance reviews and compensation considerations)

##### **Advice**

This is how the governance process will work in reality (including the organizational structure, roles, responsibilities and coordination mechanisms). There is no single correct way to define governance structure. It is dependent on the size of the firm, the scope of the activity, the skill of staff and the culture of the organization. Developing a new data governance mechanism will likely require new skill sets. Collaboration with senior business stakeholders (appointment of stewards) and HR (recruiting) will help facilitate implementation. Formal training (i.e. data management boot camp) will help with onboarding.

##### **Questions**

- Has the data management organizational structure been defined and socialized to make sure it is appropriate for your organization?
- Have the roles, functions and responsibilities been defined and verified?
- Have potential stewards been identified in collaboration with business stakeholders?
- Is there a secession plan in place?
- Is there an onboarding and training mechanism to support acclimation to new data management functions?

##### **Artifacts**

- Governance structure (organization charts, roles and responsibilities)
- RACI matrix (or equivalent) denoting accountability
- Operating procedures (how are appointments determined, onboarding and training requirements)
- Working groups and committee (designations, charters, participant rosters, minutes, directives)
- Bi-directional communication (stakeholder rosters, internal memos and distribution lists)

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
No governance structure exists.	The concepts associated with establishing an enterprise governance structure are being discussed	Enterprise-wide governance structure is being developed. Representatives from involved business lines and control functions are participating in the planning process	Enterprise governance structure has been defined and staffed. Individuals have been informed of their role and responsibilities.	Enterprise governance structures are implemented. Working committees are operational. Stakeholders are held accountable for their participation in the data management program	Stakeholders performance reviews and compensation are aligned with the enterprise governance objectives

## 4.2. Content governance is defined

### 4.2.1. Authorized data domains have been identified and inventoried

<p><i>Authorized data domains are logical representation of a category of data that supports a business function (e.g. “trades” is a data domain that supports capital markets). Data domains include both internally generated data as well as externally acquired (market) data. It is imperative that these strategic data assets are identified and inventoried to ensure their proper use in critical applications</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"><li>• Authorized data domains are identified.</li><li>• Authorized data domains are declared.</li><li>• Authorized data domains are inventoried</li></ul>	<p><u>Advice</u></p> <p>Authorized data domains identify the “official” categories of data to be used for business and reporting functions. ADDs can be either physical or logical sources of data, depending on the existing legacy environment of the specific categories of data. The goal is to identify, define and inventory these categories of data for future use throughout the organization. It is imperative for business (not just IT) to be involved in the designation of the categories of data that are required to support organizational operations – regardless of their physical existence.</p>				
	<p><u>Questions</u></p>	<ul style="list-style-type: none"><li>• Has business (as well as IT) been involved in the designation of authorized data domains?</li><li>• Are all critical business functions represented in the discussion?</li><li>• Has the reverse engineering (forensics) to define and verify data flows and transformation processes been performed and verified?</li><li>• Have domain owners (responsible for quality and availability) been identified?</li></ul>			
	<p><u>Artifacts</u></p>	<ul style="list-style-type: none"><li>• Criteria for determination of ADDs</li><li>• Inventory of authorized data domains (with formal declaration)</li><li>• Domain owners and responsibilities</li><li>• Business process definition and documentation</li><li>• Bi-directional communication</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data domains are not defined or inventoried	Involved stakeholders are in the process of defining data domains and logical groupings	Data domains are in the process of being defined. Feedback is being collected from business user and other stakeholders	Data domains are declared and are in the process of being inventoried	Prioritized data domains have been identified, verified, declared, inventoried and authorized by involved stakeholders.	

#### 4.2.2. Critical data elements (CDEs) have been identified and inventoried

<p><i>CDEs refer to the individual data attributes that are used to support critical business functions. CDEs must be identified and catalogued to ensure evidence of proper sourcing, lineage and usage.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• CDEs have been identified and inventoried.</li> <li>• CDE sources have been documented.</li> <li>• Approved business definitions have been assigned.</li> <li>• Data lineage has been documented and validated.</li> <li>• CDEs (and their lineage) are maintained in accordance with data management policy and standards</li> </ul>	<p><u>Advice</u></p> <p>CDEs are data elements that have a documented material impact on business functions. CDEs must be identified and catalogued to ensure they are fit-for-purpose. CDEs are defined based on an understanding of how important data concepts are assembled. This includes the organic (granular) reference data as well as the business rules used to manufacture derived, calculated or aggregated concepts. CDE designation are based on business requirements. Business users and analysts need to be intimately involved in this designation process.</p>
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>• Have the core business processes been defined (via reverse engineering: source → to element → to concept → to compounding process → to business process → to application) and verified?</li> <li>• Have the distinctions between organic data, derived data and business calculations been defined and verified?</li> <li>• Are approved business definitions (and relationships) assigned and stored as metadata?</li> <li>• Are CDEs aligned with business processes?</li> <li>• Are the sources of CDEs identified and documented?</li> <li>• Are representatives and SMEs from business and IT involved in the designation process?</li> </ul>
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>• Criteria for CDEs (bi-directional feedback, verification and sign-off)</li> <li>• Approach – how to apply criteria</li> <li>• CDE selection, inventory and declaration (with verification)</li> <li>• Business process (reverse engineering) documentation</li> <li>• CDE (and classification) maintenance procedures</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data elements are not prioritized or designated	The identification of which data element is critical for various applications is being debated by involved stakeholders	Critical data elements (and their definition) are designated and under review by involved stakeholders.	CDEs and business definitions are verified. The process by which data is compounded (lineage) is documented	CDEs are identified, inventoried and approved. Source and lineage is documented. CDEs are declared. CDEs are routinely maintained. Data lineage is documented and validated. Approved business definitions are aligned across the enterprise	

#### 4.2.3. Data domain taxonomies are actively implemented, maintained and enforced

<p><i>Taxonomies define how things relate. Data taxonomies define relationship of elements within a data domain. Taxonomies are critical to establishing common definition and language of data across an enterprise and are required to ensure data's proper use.</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"> <li>Authorized data domains are verified by business subject matter experts.</li> <li>Authorized data domain taxonomies are being published and are being used by upstream/downstream systems (existing and new).</li> <li>Internal taxonomies are aligned with (and cross referenced to) global standards</li> </ul>	<u>Advice</u>	Taxonomies define hierarchical relationships. Ontologies define how financial instruments and processes work in the real world. Once designated, they need to be managed (via policy) to ensure that they are implemented, maintained and used. Adjustment to data domain taxonomies and conceptual/logical models should be formally aligned with the firm's change management policies (including change approvals, impact analysis, controlled implementation/rollout)
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Have data domain taxonomies (and conceptual/logical models) been verified by business subject experts?</li> <li>Have data taxonomies and models being published and are being used in existing and new systems?</li> <li>Have policies and standards for managing taxonomies/models been defined, verified, sanctioned and published?</li> <li>Has governance over taxonomies been aligned with existing change management policies?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Policy and standards on use and maintenance</li> <li>Mapping and transformation to ensure implementation by upstream and downstream systems</li> <li>Bi-directional communication (verification, approvals, agreements)</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data domain taxonomy governance does not exist	Data taxonomy governance is being debated by relevant stakeholders	Policies to ensure the maintenance and use of established data taxonomies and being developed in collaboration with business and IT subject matter experts	Policies related to the use and maintenance of authorized data taxonomies have been defined, and have been reviewed and approved by relevant stakeholders	Taxonomies are being used by upstream and downstream systems. Data is shared across business processes. Data harmonization is achieved.	Operational taxonomies are aligned with (and cross-referenced to) industry standards

#### 4.2.4. Unique and precise data identification schemes and methodologies have been defined, applied and are in use

<p><i>Data Identification schemes and methodologies are used to ensure precise identification of data factors of input. Customer ID; Legal Entity ID; Product ID are examples of unique identification. Establishing ID methodologies are critical for data aggregation, classification and analysis. Unique identification is a foundational concept and is emerging as a required component for regulatory reporting and risk analysis.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Identifiers have been defined for critical business entities (e.g. product; customer; account; etc.).</li> <li>Internal entity IDs have been assigned, published and are being used across business processes.</li> <li>Internal IDs are aligned (and cross referenced) to industry standard identifiers</li> </ul>	<u>Advice</u>	Identification schemes for instruments, entities, customers and products need to be unique and precise. Standard identifiers need to be mapped to any proprietary identifiers used in consuming applications. Unique identification is a core foundational tenet of data management that is governed by policy and enforced by standards.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Have unique and precise (officially sanctioned) identified been established for all instruments, entities, customers and products?</li> <li>Has policy been developed and approved to ensure these identifiers are used in business applications?</li> <li>Have standard identifiers been published are cross-referenced to any proprietary identifiers?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Policy about standard identifiers</li> <li>Inventory of identification standards being used</li> <li>Cross-referencing and transformation documentation</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Disparate or inconsistent identification schemes are being used in silos throughout the organization.	The areas that need unique and precise identifiers are being debated	Areas that need unique identifiers have been defined and verified for critical business domains (i.e. product, client, entity, etc.)	Identifiers have been assigned, published and are being used across business processes. Plans are being debated on the approach for concordance (cross-referencing) of legacy identifiers to the new standard.	Identifiers for specific data domains are declared as "standard" for the firm. Legacy identifiers have been cross-referenced and aligned. New applications are required to use the new standards.	Identifiers are cross-referenced to industry standard identifiers

#### 4.2.5. Data classifications are defined and assigned

*Data classifications are critical for control and analysis of data. Data classifications are critical to establishing standard treatment of data across an enterprise and for aggregating data for analytical purposes.*

##### **Sub-Capability Objectives**

- There is a coordinated process for the assignment and approval of data classifications.
- Data classifications have been established, assigned to data domains and verified by stakeholders.
- Data classifications are adopted and implemented in systems.
- Data classifications dictate how data is to be handled throughout the business process (e.g.: classification of data denotes privacy treatment, info-security treatment, masking, encryption, risk analysis, etc.).

##### **Advice**

There are many forms of data classification. Some identify data according to industry classifications. Some identify data according to its type or sub-type within a market segment. Some are used to identify instrument types. Some are used to determine how data will be managed or controlled (i.e. data sensitivity classification or data privacy classification). Policies, procedures and standards are needed to ensure the appropriate assignment, use and maintenance of classification schemes. The key stakeholders in data classification should include technology, business, legal and compliance. In many cases, compliance policies may already exist, but they may not be integrated into the “appropriate use” or SDLC processes within a firm.

##### **Questions**

- Have all classification requirements been defined, documented and verified?
- Are policies and standards governing the assignment and use of classification schemes been developed and approved?
- Are relevant stakeholders (business, technology and operations) involved in the data classification definition and verification process?
- Are data classification schemes aligned with other control functions (security, privacy, compliance)?

##### **Artifacts**

- Documentation on the process for developing, assigning and maintaining classifications
- Classification scheme policies and standards
- Operational adoption (evidence)
- Bi-directional communications (feedback, verification, authorizations)
- Storage of classifications as metadata

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no standard data classification schemes in place	The areas that need classification are being debated	Areas that need data classifications have been defined and verified	Data classifications are established, assigned to data domains and verified by stakeholders	Classifications are adopted and implemented in systems. Classification schemes/standards are made mandatory by data policy.	Classification schemes are aligned with internal ontology to support flexible (scenario-based) analysis

### 4.3. Policy and standards are written and approved

#### 4.3.1. Policy and standards are written and complete

<p><i>Policy and standards define how business, technology and operations manage and control data. They address how data is acquired, managed, maintained and delivered throughout an organization. Policy and standards address how data is acquired internally as well as from external sources and via corporate events (i.e.: mergers, acquisitions and other corporate actions)</i></p> <p><i>Policy and standards must be developed in partnership with stakeholders to ensure buy-in as well as alignment with existing strategies and controls. Policy and standards must reflect the basic principles of data management. Although policy and standards can vary, most will contain rules and guidelines pertaining to data ownership; data definition, data lineage, metadata, data quality; data access; permissible use; data sourcing and controls</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Policy and standards are developed in collaboration with (business, technology and operations) stakeholders.</li> <li>Policy and standards are complete and verified</li> <li>Policy and standards are in alignment with Data Management Strategy</li> </ul>	<p><u>Advice</u></p> <p>The development and implementation of policy and standards takes the data management program from conceptual to functional. These are the “rules of data” with rationale (to ensure that data is trusted and managed) and consequences (from MRIA reports to business prohibitions). They need to be both practical and stringent enough to change the way the firm operates. They need to be implemented via data standards and based on core principles. They must be linked to strategy and integrated into the SDLC process. The development and implementation of data management policy should be viewed as the bedrock of the data governance program.</p>				
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>Have the data management policies and standards been created and published?</li> <li>Are they complete and linked to control functions (i.e. cross-border, security, privacy), data acquisition processes (i.e. legal contracts, entitlements), data usage (i.e. authorizations, redistribution), data retention (i.e. CRUD), quality control (i.e. business rules, logic checks, transformations), data meaning (i.e. identifiers, definitions, classifications), formats and messaging (i.e. schemas, metadata, ISO standards)</li> <li>Are they linked to (and aligned with) data management strategy?</li> <li>Have they been developed in collaboration with stakeholders and verified?</li> <li>Are they aligned with the SDLC process?</li> <li>Have they been reviewed and approved by both audit and executive management?</li> <li>Is your organization able to comply with the data management policy (or is burn-in required)?</li> </ul>				
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>Definition of the areas that are covered by policy and standards</li> <li>Documented and approved policies and standards</li> <li>Bi-directional feedback with relevant stakeholders (development process and roster of stakeholders)</li> <li>Approvals from Executive Committee and Board</li> <li>Evidence that policies and standards have been communicated (i.e. memos, town halls, announcements)</li> </ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no formal data policy	The areas that need to be covered by organizational policies, procedures and standards are being debated	Draft policies and standards have been documented and shared with involved stakeholders	Draft policies and standards are complete and cover how data is acquired, managed and delivered	Policies and standards are complete, aligned with DM strategy and verified by involved stakeholders	



#### 4.3.2. Policy and standards have been reviewed and approved by relevant program stakeholders

<p><i>Policy and standards must be shared and reviewed by relevant stakeholders to ensure agreement, alignment and buy-in. Policy and standards are critical elements and should be subjected to a rigorous challenge process by stakeholders</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Policy and standards are developed in collaboration with (business, technology and operations) stakeholders.</li> <li>Policy and standards are complete and verified</li> <li>Policy and standards are in alignment with Data Management Strategy</li> </ul>	<u>Advice</u>	Policy and standards need to be formally reviewed and approved by key stakeholders. They also need to be practical and grounded in reality. Without this verification and approval process - support and adherence will be difficult to achieve. Investigate the processes used to collaboratively develop and approve policies and standards. Ensure that the participants are at the right level of organizational seniority.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Have the right stakeholders at the right levels of seniority been involved in the development process?</li> <li>Have policies and standards been verified and approved by stakeholders and executive management?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Roster of stakeholders and communication trail</li> <li>Evidence of review and approval (minutes, sign-off)</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no stakeholder approval process in place	Stakeholders that need to verify and approve policy and standards are identified and confirmed	Stakeholders are meeting to discuss policy and standards. Draft policy and standards are being reviewed	Draft policies and standards have been evaluated against rules and guidelines for ownership, definition, lineage, metadata, quality, permissible use, sourcing and controls	Policies and standards are verified and approved by program stakeholders and executive governing bodies.	

#### 4.3.3. Policy and standards have been reviewed and approved by senior executive governing bodies

<p><i>Policy and standards must be recognized and supported by senior executive management. Data governance must be aligned with (and become a component of) the existing governance structures of the enterprise.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Policy and Standards have been submitted to the organizational governance mechanism for evaluation.</li> <li>Policy and Standards have been approved</li> </ul>	<u>Advice</u>	Policy needs to carry the authority of executive management.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Do those involved in corporate-level review fully understand the data management imperative (and challenges)?</li> <li>Was the approval process formal with the right executives involved in the process (and via established organizational approval processes)</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Distribution roster</li> <li>Evidence of evaluation (BOD agenda, minutes)</li> <li>Formal approval and associated communications</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data management policies and standards have not been approved	The process needed to define and implement data management policies and standards is being investigated.	Policy and standards are in the process of being reviewed with established governance bodies	Established governance bodies have reviewed and approved the data management policies and standards	Data management policy and standards are mandated and compliance is being audited	



## 4.4. Program governance is operational

### 4.4.1. Funding model is operational

<p><i>The goal is to ensure that the business case and funding model (see section 2.0) is successfully executed and administered across the organization.</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"><li>• Funding model is operational.</li><li>• Accountable parties for the budget of the data program are identified and empowered</li><li>• Funding model is repeatable and aligned to organizational funding cycles.</li></ul>	<p><u>Advice</u></p> <p>An operational funding model means that budgets are secured and aligned to expected deliverables. It means that data program executives are empowered to support the funding commitments and that data management is included in the funding cycle of the organization to secure appropriate levels of funding moving forward. The funding approach must be formalized (ideally as a stand-alone budget).</p>				
	<p><u>Questions</u></p> <ul style="list-style-type: none"><li>• Is the funding model secured and aligned to expected deliverables?</li><li>• Does the ODM have the “authority to spend?”</li><li>• Is the funding model incorporated into the organizational funding cycle and process?</li></ul>				
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"><li>• Funding model</li><li>• Formal approvals from stakeholders and budget owners</li></ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
A funding model for data management has not been defined.	The funding model strategy and approach are being discussed.	The approach to the funding model is being developed and is being socialized with relevant stakeholders.	Funding model is finalized, aligned with governance processes and extended beyond the annual funding cycle. Governance processes associated with the funding model have been approved.	The funding model is implemented across the data management program and operational. The funding model is aligned to organizational funding cycles	

### 4.4.2. Program governance routines are established

<p><i>Business requirements are an output of the established routines. All governance and control routines (meetings, metrics, reporting, etc.) are established and put into practice. Sustainable processes are in place to capture, review and verify business requirements.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Data program governing bodies are meeting and functioning in accordance with their established charters</li> <li>Metrics are being captured and reported</li> <li>Program status and progress reports are generated for executive management.</li> </ul>	<p><u>Advice</u></p> <p>Data governance is not a project but part of a sustainable program of work that becomes part of the organizational DNA. A well-functioning governance program is defined by the routines that support it. The goal is to ensure that data management becomes adopted as “business as usual” across the organization.</p>	
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>Are the governing bodies and working committees meeting on a regular basis?</li> <li>Is attendance robust (i.e. greater than 80%)?</li> <li>Are data management program objectives measured and is progress monitored?</li> <li>Are issues escalated appropriately and according to escalation policy?</li> </ul>	
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>List of committees (minutes and actions)</li> <li>Implementation of toll gates, authorizations and governance processes</li> </ul>	

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no established routines	The operating model (meetings structure, tracking processes, etc.) are being defined	Data management meeting structures and routines are defined	Meeting routines are scheduled	Meeting routines are operational. Formal records (minutes, action items, dependencies) are captured and verified	

#### 4.4.3. Data requirements are captured and prioritized

<p><i>Data requirements are an output of the established business processes and flows. Sustainable processes are in place to capture, review and verify the data requirements.</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"><li>• Routines to capture data requirements are established.</li><li>• Prioritization process is established and adhered to by relevant stakeholders.</li><li>• Prioritization processes for data requirements are designed, rationalized and approved by stakeholders.</li><li>• Priorities are reviewed and enhanced on a regular schedule.</li></ul>		<p><u>Advice</u></p> <p>Data objectives are not an afterthought. Data requirements need to be defined as part of all new projects. Without data due diligence the result can be a data requirement “fire drill” and “development anarchy” - bypassing procedures and elevating the chance of using incorrect or inferior sources in the quest to meet project deadlines. The goal is to implement a process (supported by policy) to properly capture data requirements as part of the normal systems development cycle. This requires buy-in from the business users as well as information technology – and frequently translation to ensure that data requirements are correctly specified and that they are captured at the early stage of applications development.</p>			
		<p><u>Questions</u></p> <ul style="list-style-type: none"><li>• Do business analysts and application users understand the nature of the data manufacturing process?</li><li>• Does policy exist to ensure that no new projects are initiated without definition (and verification) of data needs?</li><li>• Are formal “toll gates” (approvals) implemented to confirm, capture and verify data requirements?</li><li>• Has this data definition process become part of the operational routine? Part of the SDLC process?</li></ul>			
		<p><u>Artifacts</u></p> <ul style="list-style-type: none"><li>• Policy and standards requiring formal data requirement capture prior to application development</li><li>• Data capture and verification processes (as part of SDLC process)</li><li>• Documentation of business and data requirements (i.e. requirements matrix)</li><li>• Bi-directional communication (evidence of support from stakeholders)</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no formal mechanism for capturing and verifying data requirements	Data requirements are being discussed with relevant stakeholders	Data requirements are in the process of being defined. Interactive discussions with stakeholders are underway in a structured manner	Data requirements are defined and prioritized. Processes and mechanisms to continually maintain data requirements have been established	Routines to capture requirements are operational. Prioritization processes are adhered to by relevant stakeholders.	

#### 4.4.4. Escalation procedures are developed and documented

*Formal escalation procedures must be agreed to and documented. Escalation procedures are the mechanism used by the organization to address critical decisions and resolve conflicts.*

##### **Sub-Capability Objectives**

- Escalation procedures have been defined and documented.
- Escalation procedures are in alignment with the organizational governance structure
- Procedures have been reviewed and approved by relevant executive management and organizational governance bodies.

##### **Advice**

Escalation is needed for governance as well as for the overall data management program (remember governance follows program). This is about the practice of data management (i.e. definitions, allowable values, quality requirements, access rights, classifications, etc.) as well as any “break-glass” events affecting the organization. Formality is essential for both operational sanity and audit requirements. Make sure escalation procedures are reviewed by audit as well as endorsed by executive management.

##### **Questions**

- Do verified escalation policies and procedures exist?
- Have you made the distinction between program escalation (ecosystem) and governance escalation (data-related)?
- Have escalation policies and procedures been reviewed and accepted by audit and management?

##### **Artifacts**

- Escalation criteria, policies and procedures?
- Communication and training about the escalation process for stakeholders?

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no coordinated processes for managing conflicts or handling critical decisions	The processes and procedure for handling critical decisions and resolving conflicts are being discussed with relevant stakeholders	Escalation procedures are in the process of being defined and are under review by relevant stakeholders	Escalation procedures and mechanisms for handling critical conflicts have been documented and approved by stakeholders	Escalation procedures are operational. Procedures and processes are evaluated and approved by ex. Mgt.	

## 4.5. Program governance controls are in place

### 4.5.1. Project review and approval processes are established

<p><i>Policy and standards must be enforced in a controlled manner via checkpoints, formal review mechanisms and organizational approval boards. Controlled enforcement must be created to ensure that all new development as well as data access, usage and transmission of data adhere to established policy and standards.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Review and approve processes and responsibilities for data-related projects have been communicated to relevant stakeholders.</li> <li>Review and approval processes are operational (includes areas such as “Approval to Build”, “Approval to Access”, “Approval to Use”, “Approval to Send”, etc.).</li> <li>Data review and approval has been integrated into the firm’s technology development/SDLC process</li> <li>Review and approval processes are aligned with the control mechanisms of other existing cross-organizational processes (i.e. change management policy must have referenced, and be harmonized with, data management policy).</li> </ul>	<p><u>Advice</u></p> <p>The goal is to establish review and approval processes (checkpoints) along the data management lifecycle to ensure that decisions about acquisition, use, sharing and distribution adhere to policies and standards. The implementation of “authorizations” and “toll gates” requires balance. They must be strong enough to be effective without being bureaucratic and burdensome. The objective is to facilitate business and enable data hygiene. If a request to build/use is denied, it is in the best interest of the data management program to help remediate the reason for denial.</p>
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>Are the appropriate toll gates in place at critical decision points?</li> <li>Are the review and approval processes structured to support business processes (don’t let bureaucracy take over)?</li> <li>Are the criteria for toll gates transparent and easy to understand?</li> <li>Are project review/approval processes done collaboratively with other control functions?</li> <li>Have data control reviews been incorporated into the SDLC process?</li> </ul>
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>Documented review and approval processes</li> <li>Alignment with existing application development and other control processes</li> <li>Bi-directional communication with stakeholders</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no formal review mechanisms	Review and approval processes are being debated	Review and approval processes have been drafted. Stakeholders that are in charge of processes, checkpoints, approval boards and formal review mechanisms are identified	Review and approval processes are verified and approved by key stakeholders. Processes have been aligned with the other cross-organizational control mechanisms	Review and approval processes are operational. Processes and responsibilities have been communicated to relevant stakeholders	

#### 4.5.2. Policy and standards are enforceable and auditable

<p><i>Policy and standards must be supported by established audit processes and routines, in partnership with corporate audit. Lack of adherence to policy and standards must be elevated as a formal audit issue that must be resolved.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>The data management office has the authority to examine and enforce adherence to data management policy and standards.</li> <li>Corporate audit examines and enforces adherence to the data management policy and standards</li> </ul>	<u>Advice</u>	Putting “toll gates” into production is a balancing act. They must be strong and effective in validating the access and use of data, while at the same time be done without being burdensome and bureaucratic. Establish the necessary review and approval processes (checkpoints) along the data management lifecycle to ensure decisions about the acquisition, use and distribution of data adheres to the data management policy and standards. Project review and approval processes would include such things as formal data design reviews, formal approvals to build, approvals to access and approvals to distribute, etc.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Do you have appropriate first and second lines of defense in place to monitor controls</li> <li>Are the criteria for toll gates transparent and easy to understand?</li> <li>How are stakeholders informed of expectations and reasons for any denials?</li> <li>How is the ODM collaborating with other control functions on tollgates?</li> <li>Are new processes incorporated into the SDLC process?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Review and approval processes</li> <li>Evidence of alignment with existing application development processes (including evaluation criteria)</li> <li>Evidence of alignment with other control processes</li> <li>Compliance records and illustrations of consequences of non-compliance</li> <li>Evidence of audit process (enforceability)</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no enforcement mechanism in place	Planning meetings about the enforcement of policy and standards are underway	DMO is working with Audit to develop processes and routines needed to ensure compliance to data management policy and standards. The role and charter related to policy and standards enforcement is being developed and shared with relevant stakeholders. Audit processes and routines to ensure compliance with policy and standards have been drafted. Audit and oversight staff are involved in the discussions	Audit processes have been tested and verified to ensure they are both practical and enforceable. Escalation procedures for non-adherence have been defined and documented. Role and authority of the DMO for policy and standards enforcement has been reviewed and approved by relevant stakeholders.	DMO, audit and/or oversight resources are performing examinations and enforcing adherence	

#### 4.5.3. Metrics are in place to track program adherence, progress and outcomes

<p><i>Metrics constitute the empirical evidence required to determine the effectiveness of the data management program. Metrics development is ongoing as new business processes are developed and aligned to the data governance policy and standards. A successful metrics program will not only capture, aggregate and report metrics, but will also affect program change based on metric evaluations.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Metrics and thresholds are established.</li> <li>• Metrics are tracked and reported to relevant stakeholders.</li> <li>• Metrics are tracked and reported to executive management.</li> <li>• Metrics inform and drive program decisions and modifications</li> </ul>	<p><u>Advice</u></p>	<p>This is the implementation of metrics at the end-user level. This is designed to provide evidence of effectiveness as well as to indicate the health/well-being of the data program. All of this can lead to important remediation and keep the data management program on track. There are three types of metrics to consider: (1) measurement of the program itself; (2) measurement of data quality; and (3) outcome metrics.</p>
	<p><u>Questions</u></p>	<ul style="list-style-type: none"> <li>• Are metrics related to adherence to the data program captured, reported and used?</li> <li>• Are metrics related to data quality captured, reported and used?</li> <li>• Are metrics related to the value of the data program captured, reported and used?</li> <li>• Do stakeholders support the metrics program?</li> <li>• What form of reporting mechanisms are being used?</li> </ul>
	<p><u>Artifacts</u></p>	<ul style="list-style-type: none"> <li>• Definition of program metrics</li> <li>• Reports, dashboards, heat maps and other forms of output</li> <li>• Distribution lists and evidence of bi-directional communication/feedback</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
<p>Metrics are not in place to track program adherence, progress and outcomes</p>	<p>Metric categories and areas of data management program measurement are being defined</p>	<p>Metrics and thresholds for the data management program and for effectiveness are drafted. Discussions with key stakeholders are underway.</p>	<p>Metrics and thresholds are defined and complete. Metrics and thresholds are verified by relevant stakeholders</p>	<p>Metrics and thresholds are established. Metrics are tracked and reported to relevant stakeholders and executive management.</p>	<p>Metrics are analyzed and used to drive program decisions and modifications</p>

#### 4.5.4. Formal training programs have been designed and implemented

<p><i>Behavior and culture change are required for effective data management. Formal training is needed to ensure those with data responsibility are operating in accordance with established policy and standards.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Training programs are designed and operational.</li> <li>• Training is mandated as an operational requirement</li> </ul>	<u>Advice</u>	The skills and operating structures for data management are new to most people. Data stewards are performing specialized functions and need specific training on how to perform their function in the context of the overall data management program. Business users need training to understand the basic principles of data management, the implications of policy and standards and where to go for support. Building data management training as part of the ongoing training for all employees helps spread data management culture.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Is there a formal training program for data stewards?</li> <li>• Have the training curricula been developed in collaboration with LOB and other control functions?</li> <li>• Is participation mandatory and part of the control process?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Training curricula and materials</li> <li>• Communication about participation (class rosters, certificates of accomplishment)</li> <li>• Training and testing results</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no formal data management training programs	Training programs categories and staff skill set discussions are underway	Training curricula are drafted. Discussions with key stakeholders on skill sets required (and existing staff knowledge gaps) are underway	Training programs are designed and tested	Training programs are operational. The effectiveness of training is monitored	Training is mandated as an operational requirement

## 4.6. Technology governance is aligned

### 4.6.1. Platform governance is established

<p><i>Technology defines and governs how databases and data warehouses are approved, developed and deployed. Technology approach needs to be aligned with the Data Management Strategy.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Procedures for platform governance are defined and developed by IT and are aligned to the Data Management Strategy.</li> <li>Platform governance is implemented and operational</li> </ul>	<p><u>Advice</u></p>	<p>Technology governance is the responsibility of the technology group. Because of the close relationship between the data program and technology implementation, it is imperative that the data team collaborate with technology to create, support and enforce technology policy and standards that impact the data management program. Adhering to defined platform standards is one element of that collaboration.</p>			
	<p><u>Questions</u></p>	<ul style="list-style-type: none"> <li>What is the practice associated with identification and selection of infrastructure components that are not contained within the standard architectural framework of the organization?</li> <li>What are the mechanisms to ensure collaboration with IT in defining platform policy and standards?</li> </ul>			
	<p><u>Artifacts</u></p>	<ul style="list-style-type: none"> <li>Policy and standards for platform governance (documented and verified)</li> <li>Evidence of communication on the development and implementation of operational procedures</li> <li>Evidence of “toll gate” review process (minutes, meeting outcomes)</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no procedures governing the alignment of data management strategy with platform governance	The intersections between data management and platform governance are being debated	Procedures for platform governance are defined and shared with relevant stakeholders	Procedures for platform governance are verified by relevant data management stakeholders	Platform governance is implemented and operational	



#### 4.6.2. Data storage governance is established

<p><i>Technology, in partnership with the data management organization, defines and governs how data is persisted, archived, restored and defensively destroyed, in alignment with business objectives, the Data Management Strategy, and Legal and Compliance considerations. Storage includes online, archive, cloud and other 3<sup>rd</sup> party storage medium.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Data storage strategy and governance is defined</li> <li>• Data storage strategy and governance is aligned with business, data management and legal and compliance objectives.</li> <li>• Data storage strategy and governance is communicated to, has been reviewed by and is approved by relevant stakeholders.</li> <li>• Data storage governance (people, process, technology) has been implemented and is operational</li> </ul>	<p><u>Advice</u></p> <p>Data storage policy and standards must be part of the SDLC (or equivalent). The engagement should be about how data will be stored, archived and destroyed at the initiation of an applications development process.</p>	
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>• Does the data storage policy exist?</li> <li>• Does it cover the full data lifecycle?</li> <li>• What are the mechanisms to ensure adherence?</li> <li>• Are legal and compliance involved in this effort?</li> </ul>	
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>• Policy and standards for data storage governance (documented and verified)</li> <li>• Evidence of implementation of the storage standards (i.e. established business processes, checkpoints, document reviews and approvals)</li> </ul>	

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
A formal data storage strategy and governance (for data persistence, archive and defensible destruction) does not exist	The intersections between data management and storage activities are under discussion	Data storage strategy and governance are aligned with business, data management, legal and compliance objectives	The data storage strategy is verified by relevant stakeholders	Data storage governance is operational	

#### 4.6.3. Data distribution governance is established

*Technology defines and governs how data is distributed across the network.*

##### **Sub-Capability Objectives**

- A data distribution strategy and governance is defined by IT.
- The data distribution strategy is aligned with the objectives of the Data Management Strategy.
- Data distribution governance is implemented and operational

##### **Advice**

Data distribution policy and standards define how the organization will gain access to official stores of data. This is an essential component associated with the implementation of a control environment. Data distribution governance is contingent on the identification of the authorized data domains and the associated provisioning points. If these elements of data access have not been clearly identified - the policies associated with access (and adherence) will be cumbersome.

##### **Questions**

- Have authorized data domains been developed and adopted?
- Does the distribution strategy include a provision layer (i.e. how is distribution authorized)?
- What are the mechanisms to ensure stakeholders know how to access data?

##### **Artifacts**

- Policy and standards for data distribution (documented and verified)
- List of authorized data domains
- List of official (authorized) data provision points

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data distribution strategy is not defined.	The intersections between data management and data distribution are being debated	Procedures for data distribution governance are in the process of being defined and shared with involved stakeholders	Data distribution is aligned with and data management strategy and verified by involved stakeholders	Data distribution governance is implemented and operational	

#### 4.6.4. Data tool governance is established

<p><i>Technology, in partnership with the data management organization, defines and governs the data management related technology stack. Data tools include but are not limited to data discovery tools, data quality tools, data profiling tools, metadata tools, lineage tools, BI tools, data governance tools, etc.)</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Technology defines the permissible technology stack for related data tools.</li> <li>Tool governance is implemented and operational across all technology development teams</li> </ul>		<u>Advice</u>	<p>Different tools that perform the same functions can produce disparate data. The data management group doesn't have control over the tools used to support business – but the ODM does want to prevent misuse based on differences in various tools. Beyond this core objective, the proliferation of tools can increase complexity, add cost and inhibit systems integration. Business needs flexibility to acquire the best tools for their objectives. The ODM needs to understand (and accommodate to) the differences in the way these tools manipulate data.</p>		
		<u>Questions</u>	<ul style="list-style-type: none"> <li>Is there a mechanism for collaboration between data management and data tool selection?</li> <li>Is there agreement between IT and business regarding the scope and controls associated with IT tools?</li> </ul>		
		<u>Advice</u>	<ul style="list-style-type: none"> <li>Policy and standards for tool governance (documented and verified)</li> <li>List of authorized tools</li> <li>Bi-directional communication between IT, business and data on tool selection and criteria for approval</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no alignment between the permissible technology tool stack and data governance	The intersections between data management and permissible tools are being debated	Data tools are aligned with data governance processes	Data tool governance is documented and verified by relevant stakeholders	BI, ETL and data tool governance is implemented and operational across all technology development teams	

## 4.7. Cross-organizational enterprise data governance is aligned

### 4.7.1. Data governance is aligned with information security policy

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"><li>• Data management policy and standards are aligned with Info-security policy and standards.</li><li>• Cross-organizational dependencies are formally recognized and reflected in each groups’ policy and standards</li></ul>	<u>Advice</u>	Data management is not responsible for information security, privacy, legal and compliance but there are key elements of the data management program (i.e. identification, classification, access) that are critical to ensuring their success. Data management should be working with all control functions across the organization, identifying the touch points that impact the other control functions objectives.			
	<u>Questions</u>	<ul style="list-style-type: none"><li>• What are the mechanism to ensure collaboration with information security?</li></ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"><li>• Evidence that data management policies and standards align with policies of the other control functions</li><li>• Evidence of collaboration (communication, joint meetings, minutes, agendas, etc.)</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no alignment between data governance and information security	The alignment between data management and information security is under discussion	Cross organizational information security dependencies are being defined	Cross-organizational dependencies are verified	Cross-organizational information security dependencies are incorporated into policy and standards	

### 4.7.2. Data governance is aligned with privacy and cross-border policy

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"><li>• Data management policy and standards are aligned with privacy and cross-border policy and standards.</li><li>• Cross-organizational dependencies are formally recognized and reflected in each groups’ policy and standards</li></ul>	<u>Advice</u>		Consistent with the advice provided in 4.7.1		
	<u>Questions</u>		<ul style="list-style-type: none"><li>• What are the mechanism to ensure collaboration with privacy and cross-border policies?</li></ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"><li>• Evidence that data management policies and standards align with policies of the other control functions</li><li>• Evidence of collaboration (communication, joint meetings, minutes, agendas, etc.)</li></ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no alignment between data governance and privacy policy	The alignment between data management and privacy policy is under discussion	Alignment of privacy and cross-border policy with data management policy are in process	The alignment between data management and privacy policy is verified by relevant stakeholders	Cross-organizational dependencies are formally recognized and reflected in each groups’ policy and standards.	

#### 4.7.3. Data governance is aligned with external data usage policy and standards

<p><i>Firms routinely share their data with external party entities (vendors, service providers, reporting agencies, etc.). Policies and standards are required to govern what data can (and cannot) be shared, what approvals are required to permit external use of data and how data delivered to external parties will be protected (in alignment with corporate information security standards).</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Data management policies and procedures for 3<sup>rd</sup> party data usage have been developed and aligned with business objectives, data management strategy, privacy policies, information security policies, and permissible data usage policies.</li> <li>• 3<sup>rd</sup> Party data governance policies and standards are implemented and operational.</li> <li>• Cross-organizational dependencies are formally recognized and are reflected in relevant groups' policies and standards</li> </ul>	<u>Advice</u>		Consistent with the advice provided in 4.7.1		
	<u>Questions</u>		<ul style="list-style-type: none"> <li>• What are the mechanism to ensure collaboration with external data usage requirements?</li> </ul>		
	<u>Artifacts</u>		<ul style="list-style-type: none"> <li>• Evidence that data management policies and standards align with policies of the other control functions</li> <li>• Evidence of collaboration (communication, joint meetings, minutes, agendas, etc.)</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data management policies for third party data usage are not in place	Policies and procedures for third party data usage are in development	Policies and procedures for third party data usage are being defined and shared with involved stakeholders	Policies and procedures for 3 <sup>rd</sup> party usage is verified	Policies and procedures for 3 <sup>rd</sup> party usage is implemented and operational	

#### 4.7.4. Data governance is aligned with legal and compliance data policy

<p><i>Data Management strategy and governance must be aligned with legal and compliance data policies not already discussed.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Data Management policies and standards are aligned with legal and compliance data policy and standards.</li> <li>• Cross-organizational dependencies are formally recognized and reflected in relevant groups' policy and standards</li> </ul>	<u>Advice</u>	Consistent with the advice provided in 4.7.1
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• What are the mechanism to ensure collaboration with external data usage requirements?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Evidence that data management policies and standards align with policies of the other control functions</li> <li>• Evidence of collaboration (communication, joint meetings, minutes, agendas, etc.)</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no alignment between data governance and legal/compliance policy	The alignment between data management and legal/compliance policy is under discussion	Alignment of privacy and compliance policy with data management policy are in process.	The alignment between data management and legal/compliance policy is verified	Cross-organizational information security dependencies are incorporated into policy and standards	

## 5.0 DATA ARCHITECTURE

### **Definition:**

*Data Architecture* speaks to the design, definition, management and control of information “content”. Data Architecture identifies data domains, documents metadata, defines critical data elements, establishes taxonomies and ontologies that are critical to ensuring that the meaning of data is precise and unambiguous and that the usage of data is consistent and transparent.

### **Purpose:**

A Data Architecture function establishes consistency in definition and use of data throughout an organization. Adhering to a prescribed data architecture forces business and technology to take the necessary steps to define and document data meaning, define the appropriate use of the data, and to ensure that proper governance is in place to consistently manage “data as meaning” on a sustainable basis.

### **Introduction:**

Data exists throughout an organization across all facets of business operations. The design of a firm’s Data Architecture is based on a comprehensive understanding of business requirements and their impact on what data is needed. Unraveling the business process informs how data should be identified, defined, modeled and related. Technology Architecture then dictates how the data architecture design is instantiated into physical repositories in order to provide optimized access, security, efficient storage management and speed of processing.

In order to establish a successful Data Architecture program, there are a number of specific architectural ‘steps’ that must be developed and adhered to. First is to understand the scope of data needed to satisfy the business requirements. The scope of data generally falls into two categories: (1) identification of logical domains and (2) identification of the physical repositories.

- **Identification of Logical Domains of Data**  
Logical domains of data represent the data (not the databases) that are needed to satisfy the business requirements. Logical data domains are grouped into three categories:
  1. **Reference Data Domains (“nouns”):** These describe the formal or contractual attributes of a business object (i.e.: products, instruments; customers, legal entities; counterparties; etc.)
  2. **Transaction Data Domains (“verbs”):** these describe the actions associated with an event (sale ; trade; deal; payment; etc.)
  3. **Derived Data Domains (“adjective”):** these describe the newly created, quantitative values that result from an aggregation or analytical operation of reference and/or transactional attributes (i.e.: calculated balances; exposure metrics; demographic calculations; etc.)
- **Identification of Physical Repositories**  
Underlying the logical data domains are multitudes of physical (often overlapping) repositories of data that will map into the logical data domains. Identification of these underlying physical repositories is a critical step towards minimizing the complexity of legacy environments, reducing replication, better understanding data lineage, assigning data ownership and assessing data quality.

Once the domains (and their underlying physical sources of data) have been identified, precise business definitions (common semantic language) for the identified data entities must be assigned and agreed upon by critical stakeholders. Data Architecture is about managing meaning. The importance of assigning precise definitions in the context of business reality (relationships), the creation of a shared 'data dictionary' and getting the buy-in from both upstream and downstream users cannot be minimized. Without this common understanding of data attributes (aligned to business meaning), Data Architecture will struggle to succeed, the risk of inappropriate use of data will increase and the ability to 'share' data across an enterprise with confidence will be hindered.

The next step in addressing data architecture is to define *data taxonomies and business ontologies*. Data taxonomies define how data entities are structurally aligned and related. For each officially designated data domain that is identified, inventoried and deemed critical, a taxonomy must be defined, maintained and mandated for all systems using this data as input into their business functions. With critical business function taxonomies defined and in place, the organization needs to model the relationships between taxonomies into a business *ontology*. Ontologies represent the relationships and knowledge of multiple related taxonomies across functional domains.

Semantics, taxonomies and ontologies define and relate the content of data in order to enable the organization to realize its maximum value in a consistent and controlled manner. Once the content is defined, it needs to be precisely described as *metadata*. Metadata falls into three categories: descriptive metadata, structured metadata and administrative metadata.

- Descriptive metadata describes attributes used for discovery and identification (i.e.: author; title; source).
- Structural metadata describes how attributes are created or derived (ex: a derived attribute would describe what attributes that were used to derive its value).
- Administrative metadata provides information related to the creation, classification and/or appropriate use of data. Administrative metadata would include information like "NPI"-Non Public Information; data access entitlements; archive and retention requirements, etc.

**Goals:**

- Data Architecture defines common meaning of data
- Common meaning is driven by business stakeholders
- Relationships between and among data attributes is based on business requirements
- Data is designed logically, abstracted from physical implementation
- Data Architecture informs physical implementation

**Core Questions:**

- Are business stakeholders driving content definition?
- Are policies in place to govern the creation and maintenance of data attributes and relationships?
- Are governance procedures in place to ensure adherence to established data architecture standards?
- Are design reviews in place and required to ensure enhancements and new development are utilizing standard data architecture definitions?
- Is adherence to data architecture standards auditable?



## 5.0 Data Architecture

### 5.1. Identify the data

#### 5.1.1. Logical domains of data have been identified, documented and inventoried

<p><i>Logical domains of data represent the data (not the “databases”) that are needed to satisfy the business requirements. Logical data domains fall into three categories - reference data; transactional data; and derived data. Identification of these domains must be driven by the Business from the perspective of “what <b>data</b> is needed to perform the required business functions?”</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"><li>Business stakeholders have been selected to drive the identification of the logical data domains.</li><li>Logical data domains have been identified and prioritized</li></ul>	<p><b><u>Advice</u></b></p> <p>The overall goal is to ensure proper usage of data and to get stakeholders to think about data management in terms of data content concepts and not the physical repositories (databases). All of this needs to be based on an understanding of how the business functions operate in reality. Once the logical domains (categories) are defined, they must be mapped to their physical locations and associated with authorized distribution points.</p>				
	<p><b><u>Questions</u></b></p> <ul style="list-style-type: none"><li>Has the firm identified and declared the categories of data needed to satisfy business requirements?</li><li>Has this been performed and verified in conjunction with business users?</li><li>How will the use of authorized domains be governed and enforced?</li><li>Is the distinction between “data categories” and “databases” clear?</li><li>Are governance processes in place to ensure the use and maintenance of authorized data domains?</li></ul>				
	<p><b><u>Artifacts</u></b></p> <ul style="list-style-type: none"><li>Criteria used to declare data domains as defined and authorized</li><li>Declaration of data domains (as authorized)</li><li>Identification and definition of authorized distribution points</li><li>Policy indicating what authorized data domains are and how they are to be used</li><li>Bi-directional feedback from business users and IT (verification)</li></ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Logical data domains have not been defined	Logical data domains are proposed. Business stakeholders are identified to participate in the identification process	Business stakeholders are selected to identify logical data domains. Business stakeholders are confirmed, engaged and participate	Logical data domains are validated by involved stakeholders	Logical data domains have been identified, prioritized and sanctioned	

### 5.1.2. Underlying physical repositories of data have been identified, documented and inventoried

<p><i>Underlying the logical data domains are physical (often legacy) repositories of data that will feed the logical domains. Underlying physical repositories may include streaming data and/or data stored in cloud services.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Underlying physical repositories linked to the logical data domains have been identified</li> <li>Identified repositories have been inventoried and the inventory is actively maintained</li> </ul>	<u>Advice</u>	Logical domains (and models) of data need to be mapped to where the data physically resides. The first step is the creation of the inventory of data. It doesn't really matter where the content resides (and this applies to external, streaming, master/slave and cloud-based) as long as it is linked to the authorized data domains and enforced. This is not about centralizing the data in a warehouse as long as the data has a unique namespace and is a known "source of data".
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Have the inventories of data been compiled and verified?</li> <li>Have the authorized data domains been mapped to their physical location?</li> <li>Are controls implemented to ensure namespace integrity and accessibility?</li> <li>Has policy been drafted, verified and sanctioned on the use of authorized distribution points?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Inventory of data repositories and authorized distribution points</li> <li>Mapping of authorized data domains to physical location</li> <li>Policy statements on the use of authorized distribution points</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Physical repositories have not been identified	The identification of physical data domains is underway	The inventory of physical domains is identified and shared with involved stakeholders	Physical repositories are linked to logical domains. The linkage has been documented and verified	Physical repositories have been designated and the inventory is actively maintained	

## 5.2. Define the data

### 5.2.1. Conceptual models are defined (ontologies)

<p><i>Conceptual models identify the critical data objects needed to satisfy business requirements, and documents their relationships to one another.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Conceptual models are defined, documented, and verified by key stakeholders</li> <li>Data object relationships are captured and documented into domain ontologies</li> </ul>	<u>Advice</u>	<p>Data that populates repositories about instruments, entities, transactions, holdings, etc. represent real concepts. They have terms, define characteristics, express conditions, define triggers, specify requirements and translate into legal obligations. This "organic" data is used to manufacture concepts like value, risk, concentration, exposure, centrality, durability, liquidity, cash flow, etc.</p> <p>The goal is the creation of a single (shared) conceptual view of data that defines how financial instruments, pricing and processes work in reality (terms, definitions and relationships). The "conceptual model" is used to express these organic attributes in business terms, based on the commitments in the contract at the most granular level needed for business processing.</p> <p>Ensuring that the data is aligned to common meaning is an essential requirement for achieving automation, performing complex analytics and generating trusted reports. This is one of the essential goals of data management and the building block of most financial processes.</p>
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			Harmonization of data to precise meaning is a core tenet of BCBS 239. Without shared meaning (and transparency about how aggregate concepts are created) the industry will have challenges unraveling interconnections, managing complexity and understanding linked risk across the financial system.			
		<u>Questions</u>	<ul style="list-style-type: none"><li>Has the firm defined and expressed how financial instruments, pricing and processes work in a way that is aligned to contractual obligations (i.e. ontology)?</li><li>Has the model of terms, definitions and relationships been verified by business stakeholders? Stored as metadata?</li><li>Are there mechanisms for access (i.e. glossaries) that can be used as reference points for implementation?</li></ul>			
		<u>Artifacts</u>	<ul style="list-style-type: none"><li>Business conceptual terms, definitions and relationships</li><li>Agreement on business meaning (verification by stakeholders)</li><li>Metadata repository (descriptive, structural, administrative)</li><li>Expression of terms, definitions and relationships in diagrams and spreadsheets for human use as well as axioms, rules, restrictions, attributes, classes and objects for processing</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced	
Conceptual models (ontologies) for authorized data sets do not exist	The concept of developing conceptual models is being discussed	The organization is in the process of defining conceptual models for new and existing data sets. Models are being created in collaboration with relevant business and technology stakeholders	Conceptual models have been defined for prioritized data sets. Models have been socialized and approved by relevant stakeholders.	The process of developing conceptual data models (ontologies) is part of the enterprise business, data and technology process. Policy is in place requiring the development of conceptual models for all future data sets.	Ontology is expressed in the W3C Web Ontology Language (OWL)	

### 5.2.2. Logical models are developed (taxonomies)

<p><i>Logical models are fully attributed versions of the conceptual models (taxonomies). Logical models represent the business requirements in terms of what is needed to satisfy the objectives of the business function.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Taxonomies are developed and agreed to by relevant stakeholders</li> <li>• Taxonomy relations are captured and documented</li> </ul>	<u>Advice</u>	The logical model describes data in as much detail as possible without regard to how it will be implemented in databases. The goal is to understand business requirements and translate them for systems implementation. The logical business model is a communication tool to verify requirements, discover areas where problems with meaning might arise and reconcile different perspectives. Logical models force business analysts and users to completely define the requirements and ensures that the data is not missing or misused.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Has the conceptual model been expressed as a logical data model?</li> <li>• Are all hierarchies (taxonomies) and relationships (ontologies) defined and specified?</li> <li>• Has the logical model been verified by business and IT?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Logical (canonical) data model</li> <li>• Evidence of verification and agreement</li> <li>• Mapping of logical to physical</li> <li>• Definition of transformation process and integration strategy</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Logical models for authorized data sets do not exist	The concept of developing logical models is being discussed	The organization is in the process of developing logical models for new and existing data sets. Models are being reviewed by relevant business and technology stakeholders	Logical models (taxonomies) have been defined for prioritized data sets. Policy is in place requiring the development of logical models for all future authorized data sets.	The process of developing logical data models (taxonomies) is part of the enterprise business, data and technology process	

### 5.2.3. Attribute level “business” definitions are defined, documented and approved by relevant stakeholders

<p><i>Business definitions are non-technical descriptions of data attributes that are based in contractual, legal and/or business facts.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Business definitions are documented and verified by relevant stakeholders</li> <li>• Approved business definitions are assigned to defined taxonomies (fully-attributed conceptual models).</li> </ul>	<p><u>Advice</u></p> <p>The precise meaning of data gets convoluted as data is moved around, copied and renamed. This is a problem because most firms are run by business applications. Applications are driven by software – each with their own unique data model. And all of these models use glossaries as core factors of input. Meaning is often aligned with the specific software to make sure it works. It is not aligned across all applications and not harmonized across the enterprise. This creates circumstances where firms use terms that mean different things and refer to things using different terms. These problems can be exacerbated when aligning front-office to back-office processes because terms used in the front office don’t always communicate critical nuances that are needed to meet legal obligations in the back office. These definitional differences create problems with integration and make it difficult to unravel complex business calculations or reuse data across new applications. The goal is the agreement on the meaning of data terms in the context of how they are used.</p>
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>• Has the business meaning of organic and derived terms been defined and verified?</li> <li>• Has legal and compliance been involved in the legal language used to define business concepts?</li> </ul>
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>• Business glossaries</li> <li>• Complete front-to-back stakeholder engagement</li> <li>• Evidence of feedback and verification among stakeholders</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data is not aligned to attribute level business definitions	Assignment of business definitions (in the context of how financial instruments and processes work in reality) to data attributes is in process	Attribute level business definitions (and their relationships) are in the process of being defined.	Contextual business definitions are verified and agreed to by involved stakeholders. Attribute level business definitions (and their relationships) are assigned to fully-attributed conceptual models.	Business definitions (and their relationships) have been defined, documented and approved by relevant stakeholders.	

#### 5.2.4. Metadata is defined

*Metadata must be captured and inventoried into a metadata repository so it is usable by all relevant development teams*

##### **Sub-Capability Objectives**

- Metadata is captured and inventoried into a metadata repository
- Metadata has been reviewed and approved by relevant stakeholder
- Metadata is rationalized across taxonomies and ontologies

##### Advice

Metadata is information about how content was created and its purpose. There are various types of metadata (i.e. descriptive – used to search and locate content); structural (describing how the content was created or derived); and administrative (providing information about how to manage the data). Metadata also has various applications (i.e. technical metadata – defining the data structure; business metadata – defining what it means and how it relates to other data; process metadata – describing various operations). The goal is to capture metadata that describes, locates or makes it easier to manage information. Metadata should be appropriate to the users and support the goal of interoperability – by using controlled vocabularies (standard language) and including clear statements on conditions and terms of use.

##### Questions

- Is the scope of data and business processes to be captured as metadata defined and verified?
- Is a coordinated metadata strategy defined and operational?
- Is metadata located in a central repository?
- Is the metadata complete and verified by business stakeholders and information technology?

##### Artifacts

- Metadata strategy and approach
- Evidence of capture (full spectrum) into a repository
- Evidence of review, verification and approval by stakeholders

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Metadata is not defined	Structural, administrative and descriptive metadata is being discussed	Metadata from physical repositories is being captured and inventoried	Metadata has been captured and stored in an organizational metadata repository.	Required metadata use is operational for all development. Stakeholders have reviewed and approved the metadata policies and standards	

## 5.3. Govern the data

### 5.3.1. Data architecture governance procedures are established to ensure authorized as well as controlled use of data

<p>Once data has been identified and modeled, these data become the ‘authorized’ data domains for use throughout the organization. Governance procedures must be in place to ensure control and proper use of these data</p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"><li>Identified and defined data become the ‘authorized’ data domains.</li><li>Governance procedures are established to ensure appropriate use of these data throughout the organization</li></ul>	<p><b><u>Advice</u></b></p>	<p>Once the authorized data domains have been defined, declared and sanctioned – governance procedures need to be established to ensure control over the identification, definition and usage of data. Appropriate usage (authorized and controlled) is based on an understanding of who is using data and for what purpose. This includes governance over flow of quality data as well as coordination across functions (i.e. data sharing agreements and security levels/restrictions) needed for organizational cohesion.</p>			
	<p><b><u>Questions</u></b></p>	<ul style="list-style-type: none"><li>Have authorized data domains been established and sanctioned?</li><li>Are procedures in place to ensure appropriate usage?</li><li>Has intended use been defined and verified?</li><li>Has business meaning and relationships been defined and verified?</li><li>Are data sharing agreements in place?</li></ul>			
	<p><b><u>Artifacts</u></b></p>	<ul style="list-style-type: none"><li>Authorized data domain designation</li><li>Communication about data access points and usage</li><li>Metadata repository with required structural, descriptive and administrative attributes</li></ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no governance for data content	The concepts and components associated with data content governance are being discussed.	Policy associated with the proper use of authorized data domains are being developed.	Data content governance processes and procedures are verified by stakeholders	Data content governance is aligned with business processes, implemented and operational	

### 5.3.2. Data architecture governance procedures are in place and aligned with business governance processes

<p><i>Alignment to business processes include: business process definition; operations procedures; 3<sup>rd</sup> party contract specifications; etc.</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"><li>• Data governance is aligned with business processes to ensure semantic definitions, taxonomies and CDEs are properly assigned, maintained</li></ul>	<p><u>Advice</u></p> <p>The goal is to ensure that the management of data meaning is aligned with defined business processes. Business terms including their definitions and relationships need to be properly assigned and maintained to capture and align with business reality. Data meaning needs to be aligned with operational procedures and third party data agreements. Collaboration is required to manage vendor and producer relationships and entitlement control needed to maintain the flow of data.</p>				
	<p><u>Questions</u></p> <ul style="list-style-type: none"><li>• Have business processes been defined and verified?</li><li>• Are governance procedures in place to ensure unambiguous shared meaning across the organization?</li><li>• Have critical data elements (CDEs) been aligned with established business processes?</li><li>• Are there mechanisms to ensure collaboration between data producers and data consumers?</li><li>• Are third party requirements and restrictions defined and accessible?</li></ul>				
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"><li>• Business process flow diagrams</li><li>• Bi-directional communication on data definitions and relationships</li><li>• CDE-business process mapping</li><li>• Data sharing agreements</li><li>• Security and privacy classifications</li></ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no governance in place to ensure the correct use of data.	The concepts and requirements to ensure the proper use of data is being discussed.	Data content governance policy (to ensure semantic definitions, taxonomies and CDEs are properly used) are being defined and shared with involved stakeholders	Data architecture governance policy are developed and being reviewed for approval by relevant stakeholders.	Data governance processes to ensure semantic definitions, taxonomies and CDEs are properly assigned, maintained and utilized, are operational.	



### 5.3.3. Data architecture governance procedures are in place and aligned with technology

<p><i>Alignment to Technology processes include: design reviews, approvals to build approvals, validation of appropriate usage approvals, permit to deliver approvals, etc.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• All technology development is required by governance policy to follow data architecture standards</li> <li>• All technology development use established data architecture elements</li> </ul>		<p><u>Advice</u></p>	<p>This collaboration with IT is designed to ensure alignment to business processes, compliance with restrictions and harmonization with both technical and architectural standards. This will include design reviews to ensure that IT implementation follows data architecture standards and that toll gates are in place to review technical implementation</p>		
		<p><u>Questions</u></p>	<ul style="list-style-type: none"> <li>• Is IT governance aligned with data architecture governance?</li> <li>• Is transformation, cross-referencing and integration procedures defined and documented?</li> <li>• Is there a process for technical design review?</li> <li>• Are toll gates and authorizations to build/permission to use in place?</li> </ul>		
		<p><u>Artifacts</u></p>	<ul style="list-style-type: none"> <li>• Transformation and cross-referencing diagrams</li> <li>• Governance procedures for IT implementation?</li> <li>• Bi-directional communication on technical review and authorizations</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
<p>There is no alignment between data architecture governance and IT</p>	<p>The mechanisms for aligning data content and IT are being discussed</p>	<p>Governance processes to ensure alignment between data content governance and IT are being defined and shared with involved stakeholders</p>	<p>Governance processes to ensure alignment between data content governance and IT are being reviewed and verified by stakeholders</p>	<p>Technology development adheres to governance policy and uses established data architecture elements</p>	

## 6.0 TECHNOLOGY ARCHITECTURE

### **Definition:**

*Technology Architecture* refers to the strategy, design and implementation of the physical architecture in support of the defined data architecture. Technology architecture defines the platforms and the tools and how they need to be designed for maximum efficiency in support of the data management strategy. The purpose of technology architecture is to define how data is physically acquired, moved, persisted and distributed in a streamlined and efficient manner. Physical data proximity, bandwidth, processing time, backup and recovery, archiving, etc. are all important elements of a mature technology architecture.

### **Purpose:**

The efficient and effective movement of data is critical to business operations. Technology architecture determines how data, tools and platforms operate in collaboration to satisfy business requirements. The proper alignment of these components dictates application efficiency and system processing speed. This enables firms to control costs and achieve infrastructure scalability and elasticity which are the characteristics of an enterprise infrastructure that is designed for long-term implementation success. Technology Architecture is articulated in the technology architecture roadmap. The technology architecture roadmap defines the target state infrastructure and provides guidelines for implementation. The roadmap further defines the technology governance and controls that are needed to ensure compliance across the enterprise.

### **Introduction:**

Information Architecture is the combination of both data architecture (content) with technology architecture (implementation). Data architecture should not dictate technology. Technology is the responsibility of the technology department. However, Data Architecture does *inform* technology. Data Architecture captures the information requirements of the business and translates them into the “what, where and when” of data – what data is needed; where is it to be delivered and by when. Technology Architecture is the *enabler* and defines the plan and roadmap for implementation.

There are four areas of technology architecture that are critical to a successful data management program.

1. *Database Platforms:* Technology Architecture defines acceptable data platforms for enterprise use. Enterprise-class database platforms, appliance technologies, distributed computing, and in-memory solutions all need to be defined, communicated and governed by technology architecture.
2. *Tools:* Often one of the biggest expenses and source of inconsistent handling of data is the proliferation of multiple, disparate data management technology tools within an organization. Technology Architecture must define the allowable tool stacks – what BI (Business Intelligence) tools, ETL (extract, transform, load) tools and various discovery tools are permitted for use within the organization.
3. *Storage Strategy:* Technology architecture must define how firms will store and maintain its data. A component of the target-state storage strategy is the determination of how data and data costs will be maintained, how and what data will be stored (including decisions about the use of internal versus external cloud technology), how data will be archived and retained, and how data will be defensibly destroyed/removed from the firm’s infrastructure.
4. *Operational Risk Planning:* A sound technology architecture addresses operational risk, business continuity and disaster recovery strategies. Data is the ‘life-blood’ of a firm and needs proper planning to ensure that data flows to all parts of a firm even in the face of events that interrupt business.

ss continuity.

And finally, all of the above elements of a sound technology architecture must be supported by a strong technology governance operate model. Policies must be in place, agreed to by all technology and business stakeholders, supported by executive management, and subject to internal audit scrutiny and adherence. Without governance, technology will grow and develop uncontrolled and lead to inefficiencies and security issues putting data quality at risk.

**Goals:**

- Data Architecture defines target-state infrastructure in support of data management
- Tool selection and implementation is simplified, reducing complexity and cost
- Storage strategy is developed consistent with the objectives of business while controlling cost and risk
- Operational risk architecture is implemented to ensure continuous flow of data to critical business functions in the event of an outage incident

**Core Questions:**

- Is technology architecture being driven by business requirements?
- Are policies in place to govern the selection and use of technologies throughout the organization?
- Are governance procedures in place to ensure adherence?
- Are design reviews in place and required to ensure enhancements and new development are utilizing standard technology architecture definitions?
- Is adherence to data architecture standards auditable?

## 6.0 Technology Architecture

The data management describes how data must be enabled to satisfy operational and business requirements. It describes the manner in which data must be made discoverable and accessible. It describes how data must be defined, persisted and delivered. And it describes how data must be curated and protected. When we speak of technology in the context of data management, we are talking about science needed to accomplish these objectives. Technology architecture is the design of the platforms and tools to support that technology.

Technology architecture determines how data, tools and platforms operate in collaboration to satisfy business requirements. The proper alignment of these components dictates application efficiency and system processing speed. This enables firms to control costs and achieve infrastructure scalability and elasticity which are the characteristics of an enterprise infrastructure that is designed for long-term implementation success. Technology Architecture is articulated in the technology architecture roadmap. The technology architecture roadmap defines the target state infrastructure and provides guidelines for implementation. The roadmap further defines the technology governance and controls that are needed to ensure compliance across the enterprise.

### 6.1. Technology architecture is defined and governed

#### 6.1.1. Technology architecture strategy is defined and agreed to by relevant stakeholders

*It is the role and obligation of technology to define and design the architecture needed to accommodate data requirements in collaboration with business. Technology works in collaboration with the data management organization to define the database strategies, analytics platform approaches, middleware solutions, storage and retention technologies, information security considerations, and all other elements of the holistic technology infrastructure needed to support the data management goals and objectives of the organization.*

##### **Sub-Capability Objectives**

- An integrated technology architecture strategy is designed, socialized and agreed by relevant technology, business and senior executive stakeholders.
- The integrated architecture strategy is supported and enforced by corporate audit policy.

##### **Advice**

The goal is to ensure that the data management program can be implemented by IT. Technology runs the IT mechanisms – they do not define data functionality or requirements. The opportunity is to evaluate the IT architecture strategy in light of data management objectives

##### **Questions**

- What are the mechanisms to ensure a formal partnership between the ODM and IT?

##### **Artifacts**

- IT strategy alignment with data management strategy
- Evidence of communication, socialization and approvals

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no integrated technology architecture strategy	The concepts and components of an integrated technology architecture strategy are being discussed	An integrated technology architecture strategy is in the process of being defined	An integrated technology architecture strategy is designed, socialized and agreed by involved stakeholders	An integrated architecture strategy is supported and enforced by corporate oversight policy (i.e. audit)	

#### 6.1.2. An actionable roadmap is developed and adopted for implementation of the technology architecture

<p><i>For a technology roadmap to be sustainable, it must have a budget commitment over the life of the designed roadmap.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>A multi-year technology architecture roadmap has been developed.</li> <li>The roadmap adheres to the approved technology architecture strategy.</li> <li>Budgets have been developed and approved as well as built into the firm's budget cycle processes.</li> </ul>	<u>Advice</u>	The IT roadmap must be practical and aligned to business priorities			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Is the IT roadmap aligned to approved budgets?</li> <li>Is the IT roadmap aligned with the target state objectives?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Architecture target state</li> <li>Architecture road maps</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no technology architecture roadmap	The components of the technology architecture roadmap are being debated	A multi-year technology architecture roadmap is in the process of being defined	The technology architecture roadmap has been shared with and verified by involved stakeholders. Budgets are developed and aligned with budget cycles	The technology architecture roadmap has been approved. The roadmap adheres to IT architecture strategy. Budgets are approved	-

### 6.1.3. Technology governance structure and processes are in place

<b><u>Sub-Capability Objectives</u></b> <ul style="list-style-type: none"><li>Integrated governance structure and policies are in place, operational and in alignment with the data management strategy.</li><li>Governance routines are established to ensure adherence to the defined technology architecture</li><li>All enhancements and new development are subject to architectural platform design review and approval.</li></ul>	<b><u>Advice</u></b> <p>Technology governance guarantees adherence to declared platform and tool standards. The objective is to ensure that existing governance policies reflect the goals of the data management program.</p>				
	<b><u>Questions</u></b> <ul style="list-style-type: none"><li>Is technology policy aligned with data management strategy?</li></ul>				
	<b><u>Artifacts</u></b> <ul style="list-style-type: none"><li>Is technology policy in place</li><li>Evidence of governance collaboration (stakeholder meeting agendas and results, escalation procedures, etc.)</li></ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no platform governance	The components of IT and platform governance processes are being discussed	IT and platform governance processes are in the process of being defined, aligned with data management strategy and shared with involved stakeholders	IT and platform governance processes have been aligned with the data management strategy. IT and platform governance processes have been shared with and verified by relevant stakeholders.	Integrated governance structure and policies are operational. Enhancements and new development follow architectural platform review and approval processes	

## 6.2. Data technology tool stack is identified and governed

### 6.2.1. Data technology tool selection strategy is defined and verified by relevant stakeholders

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Integrated technology tool strategy has been designed, socialized and agreed to by relevant technology, business and senior executive stakeholders.</li> <li>The tool strategy is supported by corporate policy and enforced by Corporate Audit.</li> </ul>	<u>Advice</u>	The goal is to ensure that there is a defined data management tool selection strategy and that it is aligned with the data management program. The ODM needs to ensure that the data management program can support the use of various tools (i.e. modeling, ETL, metadata, glossary, data quality, analysis). This requires coordination between data, technology and business before tool selection.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>What are the mechanisms for coordination between the tool selection process and data management?</li> <li>Are the policies, procedures and processes that govern this relationship defined and verified?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Documented tool selection strategy</li> <li>Evidence of communication, alignment and sign-off</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no technology tool selection strategy	The concepts and components of an integrated technology tool strategy are being discussed	An integrated technology tool strategy is in the process of being defined	An integrated technology tool strategy is designed, socialized and agreed by involved stakeholders	An integrated technology tool strategy is supported and enforced by corporate oversight policy (i.e. audit)	

### 6.2.2. Technology tool roadmap is developed and implemented

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Integrated technology tool roadmap has been developed in adherence to the technology tool strategy (including guidelines for new development as well as decommission plans for non-standardized legacy tool implementations).</li> <li>Budgets have been developed and approved and have been built into a firm's budget cycle processes.</li> </ul>	<u>Advice</u>	Once the tool selection strategy is defined, it needs to be converted into an actionable implementation roadmap. Make sure the technology roadmap is practical, aligned to business priorities and harmonized with internal procurement processes.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Is the tool implementation roadmap aligned with internal procurement processes?</li> <li>Is the implementation roadmap shared with the ODM?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Tool roadmap</li> <li>Evidence of alignment with the data management strategy (approvals)</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no technology tool roadmap	The components of the technology tool roadmap are being debated	The technology tool roadmap is in the process of being defined	The technology tool roadmap has been shared with and verified by involved stakeholders. Budgets are being developed and aligned with budget cycles	The technology tool roadmap has been approved. The roadmap adheres to IT architecture strategy. Budgets are approved	

### 6.2.3. Tool selection governance structure and process is in place and operational

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Integrated tool governance structure (with associated policies) are in place, operational and in alignment with the data management strategy.</li> <li>All enhancements and new development are subject to tool selection review and approval.</li> </ul>		<u>Advice</u>	The goal is to ensure the governance structure for data management tools is in place and operational. Make sure the existing governance policies and practices incorporate the data management implications.		
		<u>Questions</u>	<ul style="list-style-type: none"> <li>What are the mechanisms for coordination between the tool selection governance and data management?</li> <li>How is the firm working with “innovation teams” to keep abreast of new products and capabilities?</li> </ul>		
		<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Tool governance program</li> <li>Evidence of governance operation (meetings, procedures, etc.)</li> </ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no tool selection governance	The concepts and components of tool governance are being debated	Tool governance structure, policies and procedures are being developed.	Tool governance structure, policies and procedures have been shared with and have been verified by relevant stakeholders	Integrated tool governance structure and policies are operational. Enhancements and new development follow tool selection review and approval processes	



## 6.3. Data storage management strategy defined and governed

### 6.3.1. Data storage management strategy is defined and agreed to by relevant stakeholders

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Integrated storage management strategy has been designed, socialized and agreed to by relevant technology, business and senior executive stakeholders.</li> <li>The storage management strategy is backed by Corporate Audit.</li> </ul>	<u>Advice</u>	Data storage management is an IT function. These decisions must be coordinated with business requirements for areas like archiving capability, legal and compliance considerations, retention and defensible destruction of data. Don't forget to extend storage strategy to incorporate sandbox environments. The ODM should be a facilitator – providing coordination among the stakeholders to address these business considerations.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>What are the mechanisms to ensure coordination among IT, data and business? (at the proper levels)</li> <li>Is legal and compliance involved in these decisions?</li> <li>Are additional legal requirements (i.e. masking and anonymization) required?</li> <li>What is the firm's appetite for cloud services (i.e. alignment with information security)?</li> <li>How will the firm manage "data reconstruction" from archive</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Storage criteria, strategy and roadmap</li> <li>Evidence of alignment with the data management strategy (approvals)</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no storage management strategy	The concepts and components of an integrated storage management strategy are being discussed	An integrated storage management strategy is in the process of being defined	An integrated storage management strategy has been defined, socialized and agreed to by involved stakeholders	An integrated storage management strategy is established and is supported and enforced by corporate oversight policy (i.e. audit)	

### 6.3.2. Data storage management roadmap is developed and implemented

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Integrated data storage roadmap has been developed.</li> <li>Budgets have been developed, approved and integrated into the firm's budget processes</li> </ul>	<u>Advice</u>	Data storage, archive and retrieval plans must be coordinate across the various stakeholders (technology, business, data, legal and compliance). Prioritization is critical.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>What are the mechanisms for coordination and prioritization?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Evidence of socialization and alignment</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no data storage roadmap	The components of the storage roadmap are being discussed	The data storage roadmap is in the process of being defined	The data storage roadmap has been developed, socialized and verified by involved stakeholders. Budgets are in the process of being developed and aligned with budget cycles	Integrated data storage roadmap has been approved. Budgets are approved	

### 6.3.3. Storage governance structure and processes are in place and operational

<u><b>Sub-Capability Objectives</b></u> <ul style="list-style-type: none"><li>Integrated storage management governance structure and policies are in place and operational.</li><li>All enhancements and new development are subject to a review and approval consistent with the defined storage management strategy and roadmap</li></ul>	<u><b>Advice</b></u>		The purpose of this capability is to ensure and confirm that data storage considerations are in place and functioning as a regular part of the business.		
	<u><b>Questions</b></u>		<ul style="list-style-type: none"><li>What are the mechanisms for coordination and prioritization?</li></ul>		
	<u><b>Artifacts</b></u>		<ul style="list-style-type: none"><li>Storage consideration represented in policy and standards</li><li>Evidence of storage consideration tollgates at the onset of new development or enhancements.</li></ul>		
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Storage governance structures and processes are not in place.	The components of the storage governance structure and processes are being discussed	Storage governance structures and processes are being defined and developed.	Storage governance structures and processes have been developed, socialized and verified by involved stakeholders.	Integrated data storage governance processes are in place and operational. All enhancements and new development are subject to a review and approval consistent with the defined storage management strategy and roadmap.	

## 6.4. Operational risk planning is in place

### 6.4.1. Data infrastructure contingency planning is defined and in place

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Integrated IT operational risk management strategy has been developed, socialized and agreed to by relevant technology, business and senior executive stakeholders.</li> <li>Integrated IT operational risk management strategy is backed by Corporate Audit.</li> </ul>	<u>Advice</u>	Operational risk requirements for data must be considered early in the application development lifecycle. These requirements will dictate system and data design architecture/recovery strategies. When evaluating a data warehouse, keep in mind they are often “multi-tenant” (i.e. the requirements of the most stringent recovery might dictate the overall strategy).			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>What are the mechanisms to ensure collaboration between data management and operational risk contingency planning?</li> <li>Are all data dependencies defined and understood for recovery?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Disaster recovery plan</li> <li>Disaster recovery testing plans and results</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no data infrastructure contingency planning	The components of the IT operational risk management strategy are being discussed	IT operational risk management strategy has been defined and shared with involved stakeholders	IT operational risk management strategy has been verified by stakeholders	Integrated IT operational risk management strategy is operational and backed by internal oversight processes (i.e. audit)	

### 6.4.2. Operational risk governance structure and processes are in place and operational

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Integrated operational risk governance structure and policies are in place and in operation.</li> <li>All enhancements and new development are subject to a review and approval of their operational risk plans.</li> <li>Operational risk planning is subject to Corporate Audit.</li> </ul>	<u>Advice</u>	Operational risk routines (i.e. disaster recovery/BCP, cyber-threats, degrees of interconnectedness, testing, dependencies) must be formalized for all data systems. Changes to existing systems and/or new development must be evaluated against the operational risk guidelines. Operational risk will also be driven by regulation – ensure the governance processes are aligned with compliance in preparation for any regulatory examinations.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Is operational risk governance formalized and aligned with the firm’s risk and escalation plans?</li> <li>Is it aligned with the data management governance mechanisms?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Disaster recovery governance mechanisms</li> <li>Evidence of disaster recovery planning collaboration with compliance</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no operational risk governance processes	The components of operational risk governance are being discussed	Operational risk governance structure and policies are defined and shared with involved stakeholders	Operational risk management governance structure and policies are documented and verified by stakeholders	An integrated operational risk governance structure and policies are supported and enforced by corporate oversight policy (i.e. audit)	

## 7.0 DATA QUALITY PROGRAM

### **Definition:**

Data Quality describes the degree in which data is fit for purpose for a given business process or operation. Terms such as accuracy, completeness and timeliness are all components of data quality. Data Quality is not a process itself, but is the net result of a chain of processes across the full data supply chain to ensure that data delivered meets the needs of its intended consumers. Data Quality requires an understanding of how data is sourced, defined, transformed, delivered and lastly, consumed.

### **Purpose:**

The Data Quality Program defines the goals, approaches and plans of action to ensure that data content is of sufficient quality to support defined business and strategic goals of the organization. The Data Quality Program should be developed in alignment with business objectives, measured against defined data quality dimensions and based on an analysis of the current state of data quality.

### **Introduction:**

Data quality is a broad conceptual term that needs to be understood in the context of how data is intended to be used. Perfect data is not always a viable objective. The quality of the data needs to be defined in terms that are relevant to the data consumers to ensure that it is fit for its intended purpose. The overall goal of data management is to ensure that users have confidence that the data they are using for decision making accurately reflects the facts the data is designed to represent - without the need for reconciliation or manual transformation.

The organization needs to develop a data quality strategy and establish the overall plans for managing the integrity and relevance of data. One of the essential objectives is to create a shared culture of data quality stemming from executive management and integrated throughout the operations of the organization. In order to achieve this cultural shift, the organization must agree on both requirements and the measurement of data quality that can be applied across multiple business units and applications. This will enable business sponsors, data consumers, and IT to link data quality management processes with objectives such as better risk management, enhanced analytics, better client service and improved operational efficiencies.

Data quality can be segmented into a number of core dimensions including: completeness (*the availability of required data attributes*), coverage (*the availability of required data records*), conformity (*alignment of content with required standards*), consistency (*how well the data complies with required formats/definitions*), accuracy (*the relationship of the content with original intent*), duplication (*the redundancy of records and or attributes*), and timeliness (*the currency of content representation as well as whether the data is available/can be used when needed*). The identification and prioritization of the dimensions of data quality fosters effective communication about data quality expectations and are an essential pre-requisite of the data management program.

Creating a profile of the current state of data quality is an important initial component of the overall data quality initiative and should be performed periodically (i.e. whenever data is transformed). The goal is to assess patterns in the data as well as to identify anomalies and commonalities as a baseline of what is currently stored in databases and how actual values may differ from expected values. Once the data profile is established, the organization needs to evaluate the current state against data quality requirements

(i.e. tolerances and thresholds) as well as against business requirements to determine whether the data is fit-for-purpose.

The underlying purpose of this assessment process is to measure the quality of the most important business attributes and to determine what content is in need of remediation. A robust Data Quality Program (in partnership with business) identifies and declares what data is most important. It is this identification of *critical data elements*, or CDEs that helps inform business and technology in terms of which attributes are prioritized for key business functions. The designation of CDEs helps ensure that the highest level of accuracy and data quality treatment is applied. This is the data that needs to be “cleansed” to meet data consumer requirements. Data cleansing should be performed against a pre-defined set of business rules to identify anomalies that can be linked to operational processes.

Data cleansing should be performed as close to the point of capture as possible. There should be a clearly defined strategy (with owners) for data cleansing to ensure that cleansing rules are known and to avoid duplicate cleansing processes at multiple points in the information management cycle. The overall goal is to clean data once at the point of data capture based on verifiable documentation and business rules as well as to reconcile the processes that allow defective data content into the system. Data corrections must be communicated to (and aligned with) all downstream repositories and upstream systems. It is important to have a consistent and documented process for issue escalation and change verification for both internal originators and data vendors. It is also important to ensure that data meets quality standards throughout the lifecycle so that it can be integrated into operational data stores. This component of the data quality process is about the identification of content that is missing, determination of data that needs to be enriched and the validation of data against internal standards to prevent data errors before data is propagated into production environments.

In order for Data Quality to be sustained, a strong governance structure must be in place to support the data quality activities, ensure compliance to data quality processes and ensure the highest level of organizational support (senior executive management). Data quality processes need to be documented, operationalized and routinely validated via data management reviews and formal audit processes.

Data quality cannot be achieved centrally or monolithically. Enterprise Data Quality requires the commitment and participation of a broad set of stakeholders. Since data quality is the result of a chain of business processes, stakeholders along that chain must be in place, authorized and held responsible for the quality of data as it flows through their respective areas. Data Quality requires coordinated organizational support. Data quality processes and objectives must be part of the operational culture of a firm for it to be sustained and successful.

#### **Goals:**

- Data quality strategy is aligned with business plans and target operating models.
- Standard dimensions associated with data quality are defined and prioritized by stakeholders.
- Data quality processes (profiling, assessment, cleansing, and integration) are established and used for all data initiatives across the full systems lifecycle.

- Data profiling methodologies are standardized, documented and implemented across all critical data stores and repositories.
- Data quality metrics (tolerances, logic checks, thresholds, duplications, null sets, padding/meaningless spaces, all/no capitals, string length) are defined, documented, aligned with business requirements.
- The root causes of data errors are researched. Data quality cleansing and remediation is prioritized based on organizational requirements and business criticality.
- There is a bi-directional communication mechanism in place with suppliers to improve overall data quality. Data quality processes between data vendors and the organization are documented via SLA's and synchronized.

### **Core Questions:**

- Is it understood that Data Quality is not an objective unto itself, but an indication of an inefficient business process or broken technology?
- Is it understood that Data Quality is an cultural shift? Improved data quality touches all aspects of business and technology processes.
- For a Data Quality Program to be sustainable, training is required. Are the necessary resources (dollars and people) earmarked to implement and operate an Enterprise Data Quality Program?

## 7.0 Data Quality Program

### 7.1. Data quality program is established

#### 7.1.1. The data quality strategy and approach is defined and socialized

*Data quality strategy and approach encompasses the “what/how/who” of data quality. It needs to address the scope of the data to be scrutinized and reviewed; how the DQ assessments will be performed (metrics defined) and who will be responsible (defined roles and responsibilities). A data quality program needs to be closely aligned with the organization’s business objectives to ensure that the (most important) data is properly maintained and monitored. Data quality involves cultural change. It is critical that a documented DQ strategy and approach is socialized with relevant stakeholders (technology, business and operations), to ensure awareness, support and commitment.*

##### **Sub-Capability Objectives**

- DQ strategy and approach has been designed and developed
- DQ strategy and approach has been communicated to relevant stakeholders and
- Feedback from stakeholders has been incorporated into the final version of the DQ strategy.
- Stakeholders and senior management endorse and support the DQ program and strategy

##### Advice

The prime directive for the data management program is the delivery of data that business users and regulators have trust/confidence in to be precisely what they expect it to be without the need for transformation or manual reconciliation. The processes for meeting this “directive” cannot be arbitrary or informal. Establishing a data quality program brings focus and strategic awareness to the discipline and practices needed to ensure data is fit for its intended purpose.

The data quality strategy defines how the program will be funded and resourced as well as how it will operate. A well-defined strategy helps avoid “brush-fire” management by reviewing business requirements, establishing data quality review processes, being transparent about the causes of data quality problems and defining mechanisms for escalation as well as remediation. A data quality program requires commitment from business, operations and IT stakeholders. Visible support from executive management is needed to provide the air cover required to implement changes to already existing processes.

##### Questions

- Has the DQ strategy been developed, verified and approved?
- Is it aligned with business objectives and user requirements?
- Is there a communication infrastructure to ensure that stakeholders understand the objectives and components?
- Is there consistent engagement and verification from IT, business and operations stakeholders?
- Has the DQ strategy been endorsed by senior management

##### Artifacts

- Data quality plan and strategy
- Business rules and tolerance checks
- Lists of stakeholders and evidence of communication and approval
- Mechanism for the identification and exposure of data quality problems
- Escalation process for remediation

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no data quality strategy	Data quality strategy and approach are being debated	Data quality strategy and approach have been defined and shared with involved stakeholders	Feedback from stakeholders has been incorporated into the DQ strategy. DQ strategy has been endorsed by stakeholders.	Data quality strategy and approach have been communicated to all involved stakeholders. DQ strategy has been endorsed by senior management	

### 7.1.2. Accountable parties have been identified and roles and responsibilities have been assigned

<p><i>A Data quality program requires a network of data stewards and subject matter experts to ensure data is properly captured, processed and delivered. Accountable parties must be identified and their roles and responsibilities must be clearly and unambiguously communicated.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Accountable parties have been identified.</li> <li>Accountable parties have been aligned to the organizational data management governance structure.</li> <li>Data quality responsibilities have been assigned.</li> <li>Individuals are held accountable for the performance of their data quality function via annual reviews and compensation considerations</li> </ul>	<u>Advice</u>	A data quality program involves numerous stakeholders who are responsible for data requirements capture, profiling, remediation, definitions, metadata, transformation, root cause analysis, entitlement control and coordination across the full data ecosystem. This involves the assignment and empowerment of stewards, curators, custodians, and owners. These accountable parties need to be at the right levels of seniority as well as understand all the internal processes associated with the data quality program.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Is there a process for identifying and confirming data sponsors (authority), data owners (accountability) and data stewards (both IT and business)?</li> <li>Are the roles and responsibilities identified (i.e. via RACI matrix), verified, approved and assigned?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Evidence of stakeholder identification</li> <li>RACI matrix or other evidence of accountability assignment (including alignment to governance structure)</li> <li>Evidence of accountability (linked to reviews and compensation)</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no data quality accountability structure	Data quality accountability structures are being defined	Accountable parties are in the process of being identified. DQ roles and responsibilities are defined and shared. Feedback is solicited	Accountable parties have been identified and data quality roles and responsibilities have been assigned. Accountable parties have been aligned with the DM governance structure	Individuals are held accountable for the performance of their DQ function via reviews and compensation	



### 7.1.3. The data quality roles and responsibilities have been communicated

*The organization needs to be aware of the assigned roles, responsibilities, and authorities for the DQ program.*

#### **Sub-Capability Objectives**

- DQ governance roles and responsibilities have been defined.
- DQ governance roles and responsibilities have been aligned with overall governance strategy.
- Roles and responsibilities have been communicated to relevant stakeholders - feedback has been incorporated into the final role definitions.
- Stakeholders and senior management endorse and support the defined roles and responsibilities

#### Advice

The individuals running the data quality program are not the people that are responsible for the quality of the data. They are best viewed as part of the control function (assurance and oversight). Data quality management falls to the stakeholders and custodians who perform the operational tasks needed to ensure trust and confidence in data. These distinctions need to be clear to stakeholders across the organization.

#### Questions

- Have the data quality roles and responsibilities been communicated?
- Has senior management endorsed the data quality accountability structure?

#### Artifacts

- Bi-directional communication about roles and responsibilities

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is communication structure for data quality	Data quality accountability structures are being defined	Data quality roles and responsibilities are in the process of being defined and shared	Data quality roles and responsibilities have been communicated to relevant stakeholders. Feedback is being solicited and incorporated into the DQ strategy.	Senior management endorse and support the DQ accountability structure	

## 7.2. Quality of existing stores of data are identified and assessed

### 7.2.1. All relevant data have been identified and prioritized

<p><i>In performing a data quality analysis of existing stores of data, it is important to include all relevant data in order to determine the true state of data quality. Existing data must be profiled, analyzed and graded. Data remediation plans need to be developed and prioritized. Data Architecture defines the domains of data as “reference data, transactional data, and derived data”. Across these domains, two states exist – current and historical. All aspects and all states of data must be considered when performing a current state analysis. Across this scope of data, data can be prioritized based on their relevancy to critical business function. Data elements that are important to prioritized business functions are identified and designated as Critical Data Elements (CDEs). Designated CDSs receive the highest levels of monitoring to ensure the quality of these attributes is maintained. CDE designation is a controlled process. Changes (additions or deletions) to the list of CDEs must be reviewed and approved by business stakeholders</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• The scope of data, subject to the data quality program, has been identified (current and historical)</li> <li>• The scope of data has been prioritized in alignment with the data management strategy and business priorities.</li> <li>• CDEs are defined, verified, designated and actively maintained</li> </ul>	<p><u>Advice</u></p> <p>A data quality analysis of all relevant data (in existing repositories) is essential to define both the current state and the scope of remediation required. Quality assessment (profile, analyze, grade) should be linked to critical business processes (lineage) including the identification of critical data elements (CDEs), data architecture (management of meaning) and all associated data transformation processes.</p>
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>• Has the scope of data subject to the DQ program been identified, prioritized and verified?</li> <li>• Has the data quality profiling process been extended to all repositories (i.e. uncoupled from specific systems or applications)</li> </ul>
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>• Data domain inventories (prioritized)</li> <li>• CDE inventory (prioritized)</li> <li>• Bi-directional communication about the inventories</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data subject to the DQ program has not been identified or prioritized	The scope of data subject to the DQ program is being discussed. The concept of CDEs is being debated	The scope of data subject to the DQ program is being identified and shared with stakeholders. CDEs are being defined	The scope of data subject to the DQ program is prioritized and aligned with both strategy and business priorities. CDEs are verified	The scope of data subject to the DQ program is approved. CDEs are designated and actively maintained	

### 7.2.2. Data is profiled, analyzed and graded

<p><i>The scope of data under consideration must be profiled to determine the full spectrum of data quality dimensions (e.g. completeness, timeliness, coverage, conformity, referential integrity, consistency and levels of duplication and redundancy). This analysis must include both a row-based analysis (accuracy of the record) and a column-based analysis (statistical columnar analysis). Metadata must also be reviewed to ensure the description and intended use of data is properly defined.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• In-scope data has been profiled and statistically analyzed.</li> <li>• Metadata has been reviewed and gap analysis has been performed.</li> <li>• In-scope data has been graded and catalogued</li> </ul>	<p><u>Advice</u></p> <p>Data profiling creates a ‘quality benchmark’ for the organization. Evidence of profiling and grading will be expected in any audit review or regulatory examination. Data needs to be assessed against both fit-for-purpose criteria and the dimensions of quality (i.e. completeness; coverage; conformity; consistency; accuracy; duplication; timeliness). Data quality business rules need to be defined and captured. Statistical and columnar analysis should be included to ensure that data is ‘reasonable.’ Certain data domain types (i.e. time series) need to be evaluated against additional criteria such as gaps, spikes and abnormalities.</p>				
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>• Has all ‘in scope’ data been profiled, analyzed and graded?</li> <li>• Is data quality profiled against business rules (logic) as well as against statistical expectations (reasonableness)?</li> <li>• Are the right resources (business, operational, analytical) involved in defining quality requirements?</li> <li>• Are the results of data profiling captured as metadata?</li> </ul>				
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>• Business rules and profiling criteria</li> <li>• Reports and dashboards on data profiles</li> <li>• Statistical analysis results</li> <li>• Mechanism for assigning grades for data quality (reporting)</li> </ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no data profiling program	The profiling approach for in-scope data is under discussion. Data quality dimensions are being defined	In-scope data is in the process of being profiled and assessed. DQ dimensions are being prioritized. Metadata is being defined and shared with stakeholders	In-scope data has been profiled and statistically analyzed. Metadata (and gap analysis) has been verified by stakeholders	In-scope data has been “graded” and catalogued. Metadata has been authorized	

### 7.2.3. Data remediation has been planned, prioritized and actioned

<p><i>Based on the current state analysis performed, remediation plans must be developed to address the most pressing data quality issues, as well as timelines established for ongoing DQ evaluation and maintenance</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Data remediation plans are developed and prioritized</li> <li>• High priority data remediation is being actioned.</li> <li>• Timelines have been established for ongoing remediation</li> </ul>	<u>Advice</u>	Make sure the remediation activities are not “one off” processes – but rather established as part of a data quality routine. Data remediation needs to be implemented for both data “at rest” and “in motion.”
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Have data remediation plans been developed, verified and prioritized?</li> <li>• Do you have a DQ issues/prioritization process in place?</li> <li>• Are the data quality reports being used to remediate errors?</li> <li>• Has appropriate funding been allocated?</li> <li>• Is there a communications process related to data remediation?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Data remediation plan</li> <li>• Evidence of remediation being accomplished</li> <li>• Evidence of issue prioritization</li> <li>• Bi-directional communications on remediation plans (approval)</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data remediation is performed on an ad hoc basis	Data remediation strategy and approach are being developed	Data remediation plans are developed and shared with stakeholders	Data remediation plans are prioritized and verified by stakeholders. Timelines are established	Data is being remediated and repaired.	

## 7.3. Quality of new data is monitored, analyzed and reported

### 7.3.1. Data quality 'control points' are in place along the full spectrum of the data supply chain

<p><i>A Data Quality Program is developed to quantitatively measure the quality of data as it flows across business and technology processes. Data Quality is governed by setting goals and objectives, establishing control points, determining root-cause, remediating data gaps, and holding the business, data and technology teams accountable for achieving and sustaining the highest data quality standards possible. Data quality control points validate data along the supply chain. Data Quality Controls include the implementation of business rules, establishing workflows, setting data quality tolerances, defining exception handling processes and defining escalation procedures as data moves from data provider to data consumer.</i></p> <p><b><u>Sub-Capability Objectives</u></b></p> <ul style="list-style-type: none"> <li>• Data Quality control points are in place and fully operational along the data supply chain</li> <li>• Control remediation procedures are documented and evidenced</li> </ul>	<u>Advice</u>	Checkpoints are needed to validate data as it flows throughout the system. Rules need to be developed, workflows need to be verified, quality thresholds and tolerances need to be confirmed and exception handling routines (including escalation) need to be implemented. Data quality control points need to be applied at both the point of data entry into the organization and at the point of entry into the consuming application.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Are control points defined, verified and documented?</li> <li>• Are business rules defined, verified, documented and approved?</li> <li>• Are business process flows defined and verified in the way they handle exceptions?</li> <li>• Are control points, business rules and process flows operational?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Documentation on control points, business rules and process flows</li> <li>• Control process review and sign-off</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no data quality governance	Data quality control points and operating procedures are being debated	DQ control points and operating procedures are being defined	DQ control points and operating procedures are defined and are being shared with and verified by stakeholders	DQ control points are implemented and operational. Control remediation procedures are documented and evidenced.	

### 7.3.2. Data quality metrics are captured, reported and used to drive data remediation

<p><i>Control points capture data quality metrics and produce routine reports for executive management. Tolerance levels need to be determined and must align with the business requirements. A data quality program may include 'tiering' of data quality (defined levels of acceptable data quality based on the minimal requirements of specific businesses). Metrics are used to track data quality progress and stability and drive data remediation efforts.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Data Quality metrics are captured on a routine basis.</li> <li>• Data Quality metrics are being reported to executive, business and technology management</li> <li>• Metrics are being used to drive and prioritize remediation efforts</li> </ul>	<u>Advice</u>	Fit-for-purpose and trusted data is the goal of data management. <a href="#">Standard dimensions</a> of the categories have been developed and are being used across the industry. Definitions of (and criteria for) fit-for-purpose are derived from the requirements capture process. Metrics are used to track progress and drive remediation priorities.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Are standard criteria for measuring data quality defined and verified?</li> <li>• Are metrics being collected and reported on a routine basis?</li> <li>• Are they used to track progress and drive remediation?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Definition of quality metrics</li> <li>• Reports, dashboards, heat maps and other forms of output</li> <li>• Distribution lists and evidence of bi-directional communication/feedback</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no metrics for evaluating data quality	DQ metrics are being discussed and debated.	DQ metrics are in the process of being defined	DQ metrics are defined and are being verified by stakeholders	DQ metrics are routinely captured, reported to senior management and used to drive remediation	

### 7.3.3. Root-cause analysis is Identified and Remediated

<p><i>Data remediation is not only about correcting existing data; it is also about determining the root-cause of the data quality deterioration at the source to avoid damaging data in the future.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Root-cause is determined</li> <li>• Corrective measures to business and/or technology processes are identified and implemented</li> </ul>	<u>Advice</u>	Remediating data quality issues is not merely an exercise in data correction. Data quality issues can be systemic. Evaluate the depth and breadth of the data quality program to determine if the organization is focused more on tactical repair (find and fix) versus upstream remediation (root cause). A strong reporting structure is needed to ensure that upstream systems are aware of repetitive or continuing data quality problems
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Are root cause analysis problems defined?</li> <li>• Are corrective measures linked to root-cause analysis?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Evidence of root-cause analysis and remediation being performed</li> <li>• Evidence of reporting across the data supply chain</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Root-cause analysis is not being performed	The strategy and approaches for determining the root cause of data quality problems is being debated	The strategies and approaches for determining the root cause of data errors is being defined	The mechanisms and the requirement for determining data quality root has been identified and is being shared with and verified by stakeholders	The root cause analysis processes are defined and corrective measures are being implemented.	

### 7.3.4. Data quality processes are auditable

<p><i>Data Quality auditing occurs on 3 levels: <b>Quality Assurance (QA)</b> Assessment: Business performs self-assessments based on defined data quality processes and objectives. <b>Quality Control (QC)</b>: The Data Management Function performs a facilitated audit of a business-line's data quality processes and is empowered to enforce the business lines to remediate any gaps found to ensure adhere to data quality best practices. <b>Corporate Audit</b>: Business line data quality processes are subject to corporate audits. Failure to satisfy this review may result in formal escalated audits written against a business line or function.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Data Stewards have performed self-assessment of the business-line data quality processes (QA).</li> <li>• The Data Management Organization has performed facilitated assessments of business-line data quality operations (QC).</li> <li>• The Data Management Organization is empowered to force operational teams to remediate gaps found in their operational data quality processes.</li> <li>• Corporate Audit performs routine examinations of business-line Data Quality procedures.</li> <li>• Formal Audit Issues are generated if operational gaps be uncovered</li> </ul>	<u>Advice</u>	Data quality processes (validation, remediation, root-cause analysis, etc.) should be routinely validated and audited. Audit occurs on three levels: (1) self-attestation - where the stakeholders evaluate and assert they are following the data quality rules, (2) ODM – where the data management organization works with stakeholders to validate compliance, and (3) internal review where organizational governance has formally validated that processes are being followed.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• What are the mechanisms to ensure validation, remediation and root-cause analysis?</li> <li>• Is audit involved in the data quality program?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Evidence of self-attestation and ODM review</li> <li>• Evidence of organizational governance engagement and review</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no oversight of data quality processes	Data quality oversight strategies and approaches are being debated	Data stewards are performing self-assessment of data quality processes	The data management organization is performing facilitated assessments of data quality processes and is empowered to require gap remediation.	Audit (or the equivalent organization) is performing data quality procedure examinations.	Formal audit issues are generated if operational gaps are in data quality processes are uncovered

## 8.0 DATA CONTROL ENVIRONMENT

### **Definition:**

The *Data Control Environment* refers to the state of operation in which the data assets of a firm are holistically managed throughout the organization. There are three elements of a successfully operating data control environment...

1. The data management objectives and capabilities described throughout this document have been embraced and adopted throughout the organization.
2. The “Data Management Lifecycle”, is fully supported by all stakeholders, ensuring understanding, awareness and control of data throughout the data supply chain – from source to consumption to disposition.
3. Data management is part of the organization’s “information eco-system”, integrated and coordinated with all other control functions of the firm.

### **Purpose:**

The purpose of the data control environment is to coordinate the people, process and technology of data management into a cohesive operational model. A control environment defines the mechanisms used to capture requirements, unravel data flows and linked processes and determine how data is to be delivered to the end-consumer. A data control environment supports the Data Management Lifecycle. It ensures that proper resources and controls are in place as data moves throughout its lifecycle journey. And a data control environment ensures collaboration and alignment to cross-organizational control functions. Areas such as Information Security, Data Privacy and Change Management must operate in sync with Data Management in order to ensure data is properly managed across all business functions.

### **Introduction:**

One of the first functions within a data control environment is the orchestration of the data management capabilities and component disciplines. These disciplines have to be aligned to effectively manage data across an organization. A data control environment forces the alignment of all of the capabilities discussed in this model into a consistent operational flow. Each capability has to be properly resourced and prioritized as well as supported by business, technology and senior management.

The successful coordination of these elements is a determining factor in the success of the data management program. It is the responsibility of the data management organization and the Chief Data Officer (or equivalent executive) to structure and coordinate the operational control model in order to properly define data meaning, ensure data quality, and deliver data in a timely and efficient manner. And this must all be evidenced through demonstration of organizational structures, charters, policies and senior management directives.

Data is a core factor of input into business functions and operational processes. The Data Management Lifecycle tracks the progress of data from source ... to storage ... to maintenance ... through distribution ... to consumption ... to reuse ... to archiving ... and finally to defensible destruction. The mechanisms used to identify, align and validate the data as factors of input into business functions are derived by reverse engineering existing processes into their individual data attributes and by unraveling the “data assembly” processes used to create the required data sets.



This reverse engineering (or data requirements definition) process needs to be managed with precision to avoid confusion and miscommunication between what the business users truly need for their intended application and what IT professionals need for technical implementation. Data requirements should be modeled, aligned with business meaning, prioritized in terms of how critical it is to the application, verified by all relevant stakeholders and re-verified by stakeholders to ensure that essential concepts are not “lost in translation.” This is particularly critical for data that is shared among multiple users and for core data attributes that are used as a baseline for onward expression in operational calculations or business formulas.

For complex applications and for all aggregation-related processes, it is essential to understand and document how the data moves from system-to-system; how the data is transformed or mapped; and how the data is aligned to business definition/standard meaning. Gaining agreement on this “lineage” process is fundamental for ensuring that the results of decentralized or linked processing can be trusted to be consistent and comparable.

The final element of an effective data control environment is the integration of data management into the “information ecosystem” of an organization. The information ecosystem is a concept that describes how data is managed collaboratively across all enterprise control functions. Control functions such as information security, storage management, legal and compliance, privacy, and vendor management all have responsibilities on how data is managed. It is imperative that the policies of data management are integrated and aligned with the policies of the cross-organizational control functions to ensure data is being managed consistently and holistically across the organization.

Finally, a data control environment ensures technology’s alignment to data management policies and best practices. Data Management capabilities such as Architecture, Governance and Data Quality should all be integrated into a firm’s SDLC (Software Development Lifecycle) processes to ensure that data management considerations are being adequately addressed at the appropriate stages of the development cycle. Nothing should operate in a silo. Operating within an ecosystem recognizes interdependencies and ensures collaboration.

### **Goals:**

- A data control environment is functional and aligned with Data Management capabilities
- A data control environment ensures implementation of data management capability best practices and are routinely subject to review and audit
- A data control environment supports all facets of the Data Management Lifecycle
- A data control environment ensures collaboration across the data ecosystem. All data entering the system is subject to the collective policies across all control functions.

### **Core Questions:**

- Is the concept of data control environment understood by stakeholders?
- Are the components of data control (terms, definitions, relationships, integration, precedence, etc. ) established on a consistent basis?
- Are control processes applied across the full data lifecycle?
- Are the concepts of data control aligned across the full organizational ecosystem?

## 8.0 Data Control Environment

### 8.1. A data control environment is established and operational

#### 8.1.1. Data control environment structures are established

*An effective control environment requires the implementation of the data organizational infrastructure*

##### **Sub-Capability Objectives**

- Governance organizations and charters are written and operational
- Leadership roles have been defined and filled and are functioning according to their prescribed mandates
- Data management capabilities and component disciplines are being delivered

##### Advice

A control environment coordinates people, process and technology into a cohesive model. It defines the mechanisms used to capture requirements and unravel data flows across linked processes. A data control environment ensures that proper resources and controls are in place as data moves throughout its lifecycle journey (and facilitates collaboration with other organizational control functions). When assessing the “control environment” – take a step back and evaluate it from the perspective of the examiner or regulator.

##### Questions

- Have you examined data management capabilities as part of a composite ecosystem (end-to-end)?
- Is the program in place? With executive support? With sufficient funding? Based on foundational data management principles? With organizational buy-in? With cross functional collaboration?
- Is governance operational? Are control points implemented? Is policy defined and being adhered to?

##### Artifacts

- Formal data management program (operational)
- Stakeholders appointed with clearly defined roles and responsibilities

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no control environment structures in place	Control environment structures are being debated	Control environment organizational structures are in the process of being defined	Control environment structures (org structures, defined leadership roles, charters, etc.) are being defined.	Control environment structures, roles and functions are defined and operational	

### 8.1.2. Data control environment procedures are operational

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Data management organization and governance bodies are operational</li> <li>Control points, review processes, escalation procedures and approval mechanisms for all aspects of data management operations are established and functioning</li> </ul>	<b>Advice</b>	A data management control environment is achieved when data management procedures are operational. Understand the differences between 'planned' and 'operational' initiatives.			
	<b>Questions</b>	<ul style="list-style-type: none"> <li>Are data management procedures operational?</li> <li>Are stakeholders aware of the rules and requirements associated with data management?</li> <li>Are individuals and groups assigned roles and responsibilities for data management? Are they operational?</li> <li>Is the firm adhering to the processes related to data management?</li> </ul>			
	<b>Artifacts</b>	<ul style="list-style-type: none"> <li>The data management strategy</li> <li>The funding mechanisms</li> <li>The ODM and governance mechanisms</li> <li>Data management policies and standards</li> <li>Communication and training programs</li> <li>Standard taxonomies, identifiers and classification schemes</li> <li>Metadata repository</li> <li>Data quality strategy and mechanisms</li> <li>Cross-functional collaboration</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Control environment procedures are ad hoc	Formal control environment procedures are being debated	Formal control environment procedures (control points, escalations procedures, approval mechanisms) are being designed and defined.	Data management organizational bodies are implementing defined control environment procedures	Control environment procedures are operational	-

### 8.1.3. A data control environment adheres to industry best practices

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Control environment capabilities are consistently implemented across the organization and are aligned with industry best practices</li> </ul>	<b>Advice</b>	Those responsible for establishing the rules should be looking at and be knowledgeable of industry best practices. Executives as well as practitioners should constantly be looking at how industry approaches these challenges. Look for evidence of this 'research' into these practices.			
	<b>Questions</b>	<ul style="list-style-type: none"> <li>Does the organization have a dedicated group (or an existing group with the responsible of) keeping abreast of innovation in the industry?</li> </ul>			
	<b>Artifacts</b>	<ul style="list-style-type: none"> <li>Evidence of industry participation; evidence of attending training and data management education classes and forums.</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Control environment procedures are ad hoc	Alignment of the control environment to industry best practices is being debated	Control environment procedures are being developed in alignment with industry best practices (early stages)	Control environment procedures are being developed in alignment with industry best practices (near complete)	Control environment processes and procedures are operating in alignment with industry best practices	

## 8.2. A Data control environment supports the data management lifecycle

### 8.2.1. A data control environment ensures awareness, understanding and control of the lifecycle of data throughout the organization

<p><i>All aspects of the data lifecycle, from acquisition (internal and external) to persistence to application to disposition, are properly documented, mapped, quality controlled and maintained. The data management program must be in alignment with the control environment policy and standards of the organization.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Data lifecycle management is performed consistently, end to end, across the organization.</li> <li>• Data lifecycle is managed in accordance to the data management strategy</li> <li>• Data lifecycle is aligned with and accountable to enterprise data management organization's policy and standards</li> </ul>	<u>Advice</u>	The data management program must support the flow of data across systems and processes. The organization needs to demonstrate that it understands where the data originated, how is it distributed, whether it has been transformed (and how), whether it is consistent with its original intent and whether it is being properly used.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Is the concept of cradle-to-grave data management well understood by relevant stakeholders?</li> <li>• Does the organization align the approach to data management with data lifecycle management?</li> <li>• Is this concept reflected as a component of the data management communications strategy?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Communication about data lifecycle management</li> <li>• Alignment of the concept of DLM with data management strategy</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
Data lifecycle is not documented	Importance of supporting data through the data management lifecycle is being discussed	Policy and procedures are being developed to properly support data through the data management lifecycle (end-to-end - from procurement to persistence, to storage, distribution, usage and disposition.	Policies and procedures to support data through the data management lifecycle have been developed and have been socialized with and approved by relevant stakeholders	All support functions throughout the data management lifecycle are in place, empowered, and operational.	

### 8.2.2. Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped

<p><i>A control environment ensures that the stewardship of the critical data elements (CDEs), and the how these elements flow across linked processes (lineage) are done in coordination with Enterprise Data Management office and are aligned to EDM policy and standards.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>CDE and lineage have been identified and mapped across business lines in coordination with the enterprise data management office</li> <li>CDE and lineage mappings are in alignment with EDM policy and standards</li> </ul>	<p><u>Advice</u></p> <p>Data lineage is hard to document. With tens of thousands of applications and hundreds of systems the task is arduous. The objective is to evaluate the firm's operational commitment to this objective including the funds and the expertise needed to unravel legacy environments. Business engagement is essential.</p>				
	<p><u>Questions</u></p> <ul style="list-style-type: none"> <li>Are process flows mapped and defensible?</li> <li>Have business processes been traced from application to source (reverse engineering)?</li> <li>Are transformations defined, documented and verified?</li> </ul>				
	<p><u>Artifacts</u></p> <ul style="list-style-type: none"> <li>Documentation of source data and data flows</li> <li>Documentation of control points and transformation processes</li> <li>Documentation of processes for archiving and defensible destruction of data</li> <li>Evidence of appropriate funding</li> <li>Bi-directional communication including business and IT</li> </ul>				
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no end-to-end control procedures	Control procedures for end-to-end data flows (identification of CDEs; data quality controls; etc.) are being debated)	Control procedures for end-to-end data lifecycle are in the process of being defined.	Control procedures for end-to-end data lifecycle flows are defined and are being shared and verified by relevant stakeholders.	Control procedures for end-to-end data lifecycle are defined and operational	

### 8.2.3. The compounding processes and calculations for derived and transformed data are identified, documented and mapped

<b>Sub-Capability Objectives</b> <ul style="list-style-type: none"> <li>Data transformation processes and calculations have been identified and documented across business functions in coordination with enterprise data management office.</li> <li>Data transformation processes are in alignment with data management policy and standards</li> </ul>	<u>Advice</u>	Data concepts are constructed from organic reference data combined with business calculations. Firms need to ensure that the calculations are documented and verified (transparent) as they are transformed from process to process. Business rules and transformation processes need to be captured as metadata. Understanding data transformation is a collaborative activity between IT and business (to understand the transformation and analytical logic)			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Have data flows and transformation processes been defined and verified?</li> <li>Have business rules and derived calculations been captured and stored as metadata?</li> <li>Is the IT/business collaboration defined and operational?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Data flow diagrams</li> <li>Business rules and derived data calculations</li> <li>Documentation of transformation/calculation mechanisms</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no documentation of data transformations along the data supply chain.	The need to capture and define the processes and calculations for derived and transformed data along the supply chain is being debated.	Compounding processes and calculations are being developed	Compounding processes and calculations have been captured and documented and are being reviewed by relevant stakeholders.	Compounding processes are documented and are aligned with data management policy and procedures.	

### 8.3. Control environment ensures the discipline of data management is operating collaboratively with cross-organizational Control Functions

#### 8.3.1. Control function policies and standards are aligned with data management policies and standards

<p><i>Data Management controls and best practices are formally included in cross-organizational control function policies and standards to ensure collaboration and alignment</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Cross-organizational references are formally included in each enterprise policy and standards</li> <li>• Control teams are held accountable and subject to corporate audit to ensure formal coordination of each groups' policy and standards.</li> </ul>	<u>Advice</u>	The goal is to ensure that the policies and standards of data management are aligned with those of the other critical control functions. Take advantage of existing rules and integrate them into your data management policies, standards and procedures. Other control functions should also reference the standards and procedures of data management.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Are the mechanisms in place to support cross-functional collaboration?</li> <li>• Is there alignment between organizational control functions (policies, procedures and standards)</li> <li>• Is cross-functional coordination operational and being reviewed by audit?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Data management policies and standards</li> <li>• Other control functions policies and standards</li> <li>• Cross-referencing mechanisms</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There is no coordination with other control groups	The concept of coordinating data management control procedures with cross-functional control groups is being debated	Alignment of data management control procedures with cross-functional control groups is being defined and developed	Cross-functional control groups are including cross-functional controls in their charters.	Cross-functional coordination is operational and subject to routine audit and review	

#### 8.3.2. Regular routines are established with cross-organizational control teams

<p><i>Cross-organizational teams meet regularly to keep abreast of evolving issues related to data and data operations.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>• Enterprise control functions formally coordinates with enterprise data management via regular engagements, meetings and routines.</li> </ul>	<u>Advice</u>	Here is where the CDO becomes the "Chief Diplomacy Officer." There needs to be an engagement strategy and plan to meet and collaborate with the other control functions.			
	<u>Questions</u>	<ul style="list-style-type: none"> <li>• Are the mechanisms to support regulator coordination defined and operational?</li> <li>• Are formal meetings across control functions taking place?</li> </ul>			
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>• Engagement plan</li> <li>• Lists of key stakeholders</li> <li>• Evidence of meetings (minutes, follow-up actions)</li> </ul>			
Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no cross-functional routines taking place	The concept of cross-functional operating routines is being debated	Cross-functional routines are being defined	Cross-functional routines have been defined and are being reviewed by relevant stakeholders	Cross-functional routines are defined and operational	

### 8.3.3. All data entered into the ecosystem of the control environment is subject to cross-organizational controls

<p><i>All new data introduced into, or delivered out of the information ecosystem is subject to cross-organizational control standards to ensure enterprise-wide compliance.</i></p> <p><b>Sub-Capability Objectives</b></p> <ul style="list-style-type: none"> <li>Data introduced into or delivered out of the ecosystem is subject to design review and approval.</li> <li>Data introduced into or delivered out of the ecosystem is subject to all cross-organizational data control policy and standards.</li> </ul>	<u>Advice</u>	The goal is to ensure that all data entering the ecosystem (via any channel) is subject to the same restrictions, toll gates, authorizations, and evaluations. The challenge will be to ensure that all of the control functions understand and recognize the role and authority of the ODM.
	<u>Questions</u>	<ul style="list-style-type: none"> <li>Have the policy and standards been widely implemented?</li> <li>Have the stakeholders been informed of their role and responsibility with respect to the onboarding of data into the organizational ecosystem?</li> </ul>
	<u>Artifacts</u>	<ul style="list-style-type: none"> <li>Evidence of cross-referenced rules in other control functions policy and standards that demonstrate alignment and collaboration with the data management program.</li> </ul>

Not Initiated	Conceptual	Developmental	Defined	Capability Achieved	Capability Enhanced
There are no cross-functional controls in place	The need to ensure that all data movement into and out of the organizational ecosystem is managed collaboratively with cross-functional control functions is being debated	Cross-functional routines for all data movement into and out of the organizational ecosystem are being defined	Cross-functional controls are defined and are being reviewed by relevant stakeholders	Cross-functional controls for all data movement into or out of the organizational ecosystem is defined and operational	



## DCAM Applied Map (Operational View)

We have aligned DCAM to operational categories and mapped dependencies across the model. DCAM explains the components, capabilities and objectives of data management. DCAM Applied contains advice on how to implement DCAM as well as questions to ask and artifacts to evaluate when performing an audit. Use this map as a test of the completeness across data management capabilities.

### 1. Data Management Strategy

- a. **Develop the Data Management Strategy** (develop, align with objectives, verify, approve and ensure enforceability) [1.1.1, 1.1.2, 1.1.3, 1.1.4]
- b. **Verify Business Requirements** (capture, prioritize and approve) [1.2.1, 1.2.2]

### 2. Obtain Commitment from Stakeholders

- a. **Establish the Data Management Program** (establish and grant authority) [3.1.1, 3.1.2]
- b. **Develop Roadmaps** (engage stakeholders, develop/verify roadmaps and project plans and obtain resources) [3.3.1, 3.3.2, 3.3.3, 3.4.1, 3.4.2]
- c. **Define Business Case** (develop business case, define priorities, sequence outcomes and verify) [2.1.1, 2.1.2, 2.1.3]
- d. **Secure Funding** (develop funding model, align to organizational processes, allocate to roadmaps, make operational) [2.2.1, 2.2.2, 2.2.3, 4.4.1]

### 3. Implement the Data Management Program

- a. **Formalize the Program** (establish governance framework, define approach, assign responsibilities) [1.5.1, 1.5.2, 1.5.3]
- b. **Implement Organizational Structure** (appoint executive owner, create and fund DMO, establish program routines, document escalation) [3.2.2, 3.2.1, 3.2.3, 3.6.1, 3.6.2]
- c. **Implement Governance** (establish governance function, create plan, implement PMO, implement organizational structure, establish governance routines) [4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2]
- d. **Verify Requirements** (capture requirements, establish project review) [4.4.3, 4.4.4, 4.5.1]
- e. **Approve Policies** (develop approve and enforce policies and standards) [4.3.1, 4.3.2, 4.3.3, 4.5.2]
- f. **Capture Metrics** (develop measurement strategy, capture total expense, capture financial benefits, track program progress, track outcomes, track data quality) [1.6.1, 1.6.2, 1.6.3, 2.3.1, 2.3.2, 2.3.3, 3.6.3, 4.5.3, 7.3.2]
- g. **Communicate and Train** (implement communications program, engage with standards bodies, implement training program) [1.7.1, 1.7.2, 3.5.1, 3.5.2, 3.5.3, 4.5.4]

#### 4. Implement the Content Infrastructure

- a. **Align Data to Meaning** (identify logical domains, map to physical repositories, implement conceptual models, implement logical models, capture metadata) [1.3.1, 1.3.2, 5.1.1, 5.1.2, 5.2.1, 5.2.2, 5.2.3, 5.2.4]
- b. **Govern Content** (establish governance procedures, align with business processes, align with IT, identify critical data elements, define data taxonomies, implement identifiers, manage data classification) [5.3.1, 5.3.2, 5.3.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5]
- c. **Manage the Data Lifecycle** (map end-to-end data flows, identify business calculations) [8.2.1, 8.2.2, 8.2.3]

#### 5. Manage Data Quality

- a. **Establish DQ Strategy** (define approach, assign accountability, verify accountability) [7.1.1, 7.1.2, 7.1.3]
- b. **Profile Data** (identify and prioritize data, profile and grade data) [7.2.1, 7.2.2]
- c. **Manage Quality** (perform remediation, implement control points, perform root-cause analysis) [7.2.3, 7.3.1, 7.3.3, 7.3.4]

#### 6. Collaborate Across Ecosystem

- a. **Develop Collaboration Strategy** (define architecture concepts, align with IT capability, align with operations) [1.4.1, 1.4.2, 1.4.3]
- b. **Collaborate with IT** (align with IT/platform/data storage/data distribution and data tool governance, ensure business continuity, manage operational risk) [6.1.1, 6.1.2, 6.1.3, 4.6.1, 4.6.2, 6.3.1, 6.3.2, 4.6.3, 4.6.4, 6.2.1, 6.2.2, 6.2.3, 6.4.1, 6.4.2]
- c. **Collaborate with other Control Functions** (align with information security, privacy, cross-border, external usage, legal and compliance policies) [4.7.1, 4.7.2, 4.7.3, 4.7.4]
- d. **Implement Data Control Environment** (establish structure, implement control environment, align with industry best practice, manage organizational adherence) [8.1.1, 8.1.2, 8.1.3, 8.3.1, 8.3.2, 8.3.3]

## BCBS 239 Alignment with DCAM 1.2.1

(Data Management Implications related to the Principles of Risk Data Aggregation)

July 2015

Principle 1: Governance				
Paragraph	Summary	Component	Capability/Sub-Capability	DCAM Summary
27	Management should promote identification, assessment and management of data quality risks as part of overall risk management framework	Strategy	1.2	High level business requirements are captured, prioritized, and integrated into the data management strategy
		Business Case	2.1.1	Business case is mapped to and aligned with the data management strategy
		Governance	4.2	Content governance is defined
			4.3	Policy and standards are written and approved
		Control	8.2	Control environment supports the data management lifecycle
28	Management should approve RDAR framework and ensure sufficient resources	Strategy	1.1.2	The data management strategy is aligned with the high-level organizational objectives
		DM Program	2.2	The data management funding model has been established, approved and adopted by the organization
		Governance	3.2.3	Program Office (PMO) is established and staffed with required skill sets
29a	RDAR is independently validated	Strategy	1.1.4	The DMS has been evaluated as being enforceable by Audit (or the equivalent function)
		DM Program	3.5.2	Issue identification, prioritization, escalation and conflict resolution are defined and operational
		Governance	4.5.2	Policy and standards are enforceable and auditable
		IT Architecture	6.1.1	Technology architecture strategy is defined and agreed to by relevant stakeholders
		Data Quality	7.3.4	Data Quality processes are auditable
		Control	8.3.1	Control Function policies and standards are aligned with Data Management policies and standards
29b	RDAR applies to new initiatives including acquisitions, divestitures, new products	Strategy	1.2.1	High level business requirements have been documented and used to create the DMS
		Governance	4.3.1	Policy and standards are written and complete
		Data Quality	7.1.1	The data quality strategy and approach is defined and socialized
			7.2	All relevant data have been identified and prioritized.
			7.3	Quality of new data is monitored, analyzed and reported
		Control	8.2.2	Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped
29c	RDAR cannot be hindered by group structure	Strategy	1.1.4	The DMS has been evaluated as being enforceable by Audit (or the equivalent function)
		Business Case	2.2.3	Implementation of the DM funding model is enforced
		DM Program	3.1.2	The data management program has the authority to enforce adherence and compliance
		Governance	4.5.1	Project review and approval processes are established
			4.5.2	Policy and standards are enforceable and auditable

30	Management needs to be fully aware of limitations that prevent full RDA	Strategy	1.3.1	The DMS calls out the need to identify and prioritize authorized data domains
			1.3.2	The DMS articulates the importance of establishing policy to enforce appropriate use of authorized data domains
			1.4	The DMS is aligned with and mapped to architectural, IT and operational capabilities
		Governance	4.2.1	Authorized data domains have been identified and inventoried
		Data Quality	5.1	Identify the data
			5.2	Define the data
			5.3	Govern the data
		Control	8.3.1	Control Function policies and standards re aligned with Data Management policies and standards
31	Board is responsible for determining its risk reporting requirements and limitations	Strategy	1.1.2	The DMS is aligned with the high-level organizational objectives
		DM Program	3.3.1	Identified stakeholders commit and are held accountable to the data management program deliverables
		Governance	4.3.3	Policy and standards have been reviewed and approved by senior executive governing bodies
			4.4.4	Escalation Procedures are developed and documented
			4.5.3	Metrics are in place to track program adherence, progress and outcomes
		Data Quality	7.3.2	Data Quality Metrics are captured, reported and used to drive data remediation
		Principle 2: Data Architecture and IT Infrastructure		
32	RDAR is part of BCP	Strategy	1.4.3	Operational concepts have been incorporated into the DMS
		IT Architecture	6.4	Operational risk planning is in place
33	Bank needs integrated data taxonomy and architecture (includes identification and metadata)	Strategy	1.3	The DMS defines the importance of identifying, prioritizing and assuring the appropriate use of authorized data domains
			1.4.1	Data architecture concepts have been incorporated into the DMS
		Governance	4.2	Content governance is defined
			4.3.1	Policy and standards are written and complete
		Data Architecture	5.1	Identify the data
			5.2	Define the data
			5.3	Govern the data
		Data Quality	7.2.1	All relevant data have been identified and prioritized
			7.2.2	Data is profiled, analyzed and graded
		Control	8.2.2	Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped
			8.2.3	The compounding processes and calculations for derived and transformed data are identified, documented and mapped
34	Roles and responsibilities for data ownership are in place across the data lifecycle and for all dimensions of data quality	Strategy	1.5.3	The DMS describes the governance structure, roles and responsibilities
		DM Program	3.2	The data management organizational structure is created and implemented
		Governance	4.1	Data governance structure is created
			4.4.1	Funding Model is Operational
			4.5.1	Project review and approval processes are established
			4.5.4	Formal training programs have been designed and implemented

		Data Quality	7.1	Data quality program is established
		Control	8.2	Control environment supports the data management lifecycle
<b>Principle 3: Accuracy &amp; Integrity</b>				
36a	Must be able to generate accurate and reliable risk data. Controls should be robust	Governance	4.2	Content governance is defined
		Data Architecture	5.1	Identify the data
			5.2	Define the data
			5.3	Govern the data
		Data Quality	7.1	Data quality program is established
			7.2	Quality of existing stores of data are identified and assessed
			7.3	Quality of new data is monitored, analyzed and reported
		Control	8.2	Control environment supports the data management lifecycle
			8.3	Control environment ensures that the discipline of data management is operating collaboratively with cross-organizational control functions
36b	Policies and procedures are needed to ensure control over existing manual processes	DM Program	3.1.2	The data management program has the authority to enforce adherence and compliance
		Governance	4.3	Policy and standards are written and approved
		Control	8.2.2	Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped
			8.2.3	The compounding processes and calculations for derived and transformed data are identified, documented and mapped
36c	Risk data should be reconciled with source data	Governance	4.2.2	Critical data elements (CDEs) have been identified and inventoried
			4.3	Policy and standards are written and approved
		Data Quality	7.2	Quality of existing stores of data are identified and assessed
			7.3	Quality of new data is monitored, analyzed and reported
		Control	8.2.2	Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped
			8.2.3	The compounding processes and calculations for derived and transformed data are identified, documented and mapped
36d	Bank should strive to have a single authoritative source for risk data for each type of risk	Strategy	1.2	High level business requirements have been documented and used to create the DMS
			1.3	The DMS defines the importance of identifying, prioritizing and assuring the appropriate use of authorized data domains
		Governance	4.2.1	Authorized data domains have been identified and inventoried
			4.2.2	Critical data elements (CDEs) have been identified and inventoried
			4.3	Policy and standards are written and approved
		Data Architecture	5.1	Identify the data (logically and physically)
			5.3	Govern the data (establish sustainable data architecture governance)

		Control	8.2	Control environment supports the data management lifecycle
			8.3.1	Control Function policies and standards are aligned with Data Management policies and standards
36e	Risk personnel should have sufficient access to risk data	Strategy	1.3.2	The DMS articulates the importance of establishing policy to enforce appropriate use of authorized data domains
		Governance	4.3	Policy and standards are written and approved
			4.5.1	Project review and approval processes are established
		Technology Architecture	5.3.1	Data architecture governance procedures are established to ensure authorized as well as controlled use of data
		Control	8.1	A data control environment is established and operational
37	Bank should have a dictionary of the concepts used to ensure that data is consistently defined	Data Quality	4.2	Content governance is defined
		Data Architecture	5.1	Identify the data
			5.2	Define the data
38	There should be an appropriate balance between automated and manual systems	Strategy	1.1.2	The DMS is aligned with the high-level organizational objectives
39	Document and explain RDA processes including appropriateness of manual workarounds	Governance	4.2	Content governance is defined
			4.3	Policy and standards are written and approved
			4.4.3	Data Requirements are captured and prioritized
			4.4.4	Escalation Procedures are developed and documented
		Data Architecture	5.1	Identify the data
			5.2	Define the data
		Data Quality	7.1	Data quality program is established
			7.2	Quality of existing stores of data are identified and assessed
		Control	8.2.2	Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped
			8.2.3	The compounding processes and calculations for derived and transformed data are identified, documented and mapped
40	Bank needs to measure and monitor the accuracy of data and develop escalation plans to remediate	Strategy	1.6	The DMS defines how the data management program will be measured and evaluated
		Governance	4.3	Policy and standards are written and approved
			4.4.4	Escalation Procedures are developed and documented
			4.5.2	Policy and standards are enforceable and auditable
			4.5.3	Metrics are in place to track program adherence, progress and outcomes
		Data Quality	7.1	Data quality program is established
			7.2	Quality of existing stores of data are identified and assessed
			7.3	Quality of new data is monitored, analyzed and reported

Principle 4: Completeness				
41	RDA capabilities should include all material risk exposures (including off balance sheet)	Strategy	1.2	High level business requirements are captured, prioritized, and integrated into the DMS
		Governance	4.2	Content governance is defined
			4.3	Policy and standards are written and approved
		Data Architecture	5.1	Identify the data
			5.2	Define the data
			5.3	Govern the data
		Data Quality	7.1	Data quality program is established
			7.2	Quality of existing stores of data are identified and assessed
			7.3	Quality of new data is monitored, analyzed and reported
		Control	8.2.2	Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped
			8.2.3	The compounding processes and calculations for derived and transformed data are identified, documented and mapped
42	Make approach used to aggregate risk exposure transparent	Strategy	1.2	High level business requirements are captured, prioritized, and integrated into the DMS
		Governance	4.2	Content governance is defined
			4.3	Policy and standards are written and approved
		Data Architecture	5.1	Identify the data
			5.2	Define the data
			5.3	Govern the data
		Data Quality	7.1	Data quality program is established
			7.2	Quality of existing stores of data are identified and assessed
			7.3	Quality of new data is monitored, analyzed and reported
		Control	8.2.2	Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped
			8.2.3	The compounding processes and calculations for derived and transformed data are identified, documented and mapped
43	Aggregated risk data needs to be complete (exceptions need to be identified and explained)	Strategy	1.2	High level business requirements are captured, prioritized, and integrated into the DMS
		Governance	4.2	Content governance is defined
			4.3	Policy and standards are written and approved
		Data Architecture	5.1	Identify the data
			5.2	Define the data
			5.3	Govern the data
		Data Quality	7.1	Data quality program is established
			7.2	Quality of existing stores of data are identified and assessed
			7.3	Quality of new data is monitored, analyzed and reported
		Control	8.2.2	Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped
			8.2.3	The compounding processes and calculations for derived and transformed data are identified, documented and mapped

Principle 5 - Timeliness				
44	Must be able to produce risk information on timely basis (to meet all reporting requirements)	Strategy	1.2	High level business requirements are captured, prioritized, and integrated into the DMS
		Control	8.2.2	Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped
			8.2.3	The compounding processes and calculations for derived and transformed data are identified, documented and mapped
45	Banks must be able to produce aggregated risk data rapidly during times of stress	Governance	4.2	Content governance is defined
		Data Architecture	5.1	Identify the data
			5.2	Defined the data
			5.3.	Govern the data
		Technology Architecture	6.1	Technology architecture is defined and governed
			6.2	Data technology tool stack is identified and governed
			6.3	Data storage management strategy defined and governed
			6.4	Operational risk planning is in place
46	RDAR covers the full scope of critical risks (i.e. aggregate exposure, counterparty risk, transitive exposure. Trading exposure, positions, operating limits, market concentration, liquidity risk, state contingent cash flow, operational risk)	Strategy	1.2	High level business requirements are captured, prioritized, and integrated into the DMS
			1.3	The DMS defines the importance of identifying, prioritizing and assuring the appropriate use of authorized data domains
		Data Architecture	5.1	Identify the data
			5.2	Define the data
			5.3	Govern the data
		Control	8.2	A d control environment supports the data management lifecycle
47	Supervisors will review the bank frequency requirements (both normal and stress situations) to generate aggregate and up-to-date risk reporting in a timely manner	Strategy	1.6.2	The DMS defines the importance of developing metrics to determine and track data quality
			1.6.3	The DMS defines the importance of developing outcome metrics to determine the effectiveness of the data management program
		Governance	4.5.3	Metrics are in place to track program adherence, progress and outcomes
Principle 6 - Adaptability				
48	RDA capabilities must be flexible and able to adapt to meet on-demand, ad hoc requests (including during crisis situations)	Strategy	1.1.2	The DMS is aligned with the high-level organizational objectives
			1.4	The DMS is aligned with and mapped to architectural, IT and operational capabilities
		DM Program	3.2	The roadmaps for the data management program are developed, socialized and approved
			3.3.	Stakeholder engagement established and confirmed
			3.5.2	Issue identification, prioritization, escalation and conflict resolution are defined and operational
			3.5.3	Metrics (i.e.: KPIs, KRIs) are defined and used to track Program progress
		Governance	4.2	Content governance is defined
			4.6.2	Data storage governance is established
			4.6.3	Data distribution governance is established
			4.6.4	Data tool governance is established
			5.1	Identify the data



		Data Architecture	5.2	Define the data
			5.3	Govern the data (establish sustainable data architecture governance)
		Technology Architecture	6.1.1	Technology architecture strategy is defined and agreed to by relevant stakeholders
			6.1.2	An actionable roadmap is developed and adopted for implementation of the technology architecture
			6.4.1	Data infrastructure contingency planning is defined and in place
		Data Quality	7.1	Data quality program is established
			7.2	Quality of existing stores of data are identified and assessed
			7.3	Quality of new data is monitored, analyzed and reported
		Control	8.2.2	Critical end-to-end data flows and essential attributes for in-scope business processes are defined and mapped
			8.2.3	The compounding processes and calculations for derived and transformed data are identified, documented and mapped
49a	Flexible data aggregation processes	See Paragraph 48 above		
49b	Capabilities for data customization to drill down as needed	Strategy	1.1.2	The DMS is aligned with the high-level organizational objectives
			1.4	The DMS is aligned with and mapped to architectural, IT and operational capabilities
		Governance	4.2	Content governance is defined
		Data Architecture	5.1	Identify the data
			5.2	Define the data
			5.3	Govern the data
		Technology Architecture	6.1	Technology architecture is defined and governed
			6.2	Data technology tool stack is identified and governed
		Control	8.2	Control environment supports the data management lifecycle
49c	Capability to incorporate new developments on the organization of the business (and external factors) that influence the risk profile			
49d	Capability to incorporate changes in the regulatory framework	Strategy	1.2	High level business requirements are captured, prioritized, and integrated into the DMS
			1.4	he DMS is aligned with and mapped to architectural, IT and operational capabilities
		DM Program	3.5.2	Communication plans with external regulatory bodies are created and approved
		Governance	4.2	Content governance is defined
		Data Architecture	5.1	Identify the data
			5.2	Define the data
			5.3	Govern the data
		Technology Architecture	6.1	Technology architecture is defined and governed
			6.2	Data technology tool stack is identified and governed
			6.3	Data storage management strategy defined and governed
			6.4	Operational risk planning is in place
		Control	8.2	Control environment supports the data management lifecycle

50	Capability to generate subsets of data based on requested economic scenarios	Strategy	1.1.2	The DMS is aligned with the high-level organizational objectives
			1.4	The DMS is aligned with and mapped to architectural, IT and operational capabilities
		Governance	4.2	Content governance is defined
		Data Architecture	5.1	Identify the data
			5.2	Define the data
			5.3	Govern the data
		Technology Architecture	6.1	Technology architecture is defined and governed
			6.2	Data technology tool stack is identified and governed
			6.3	Data storage management strategy defined and governed
			6.4	Operational risk planning is in place
Control	8.2	A data control environment supports the data management lifecycle		
Risk Reporting – Principle 7: Accuracy				The DCAM capabilities required to support Principle 3 (accuracy and integrity) are the same as those needed to enable Principle 7
52	Risk reports must be accurate and give stakeholders confidence to make decisions about risk			
53a	Defined requirements and processes to reconcile reports to risk data			
53b	Reasonableness checks for accuracy including an inventory of business rules and conventions used			
53c	Procedures for identifying, reporting and explaining data errors or weaknesses in data integrity			
54	Justification of approximations			
55	Requirements for accuracy and precision in risk reporting in all circumstances			
56	Accuracy of risk reporting the analogous to accounting materiality			
Principle 8 - Comprehensiveness				The DCAM capabilities required to support Principle 4 (completeness) are needed to enable Principle 8
57	Risk reports should include exposure and position information for all significant risk areas and all significant components of risk			
58	Risk reports should identify emerging risk concentrations, limits, risk tolerances and propose actions for remediation			
59	Risk reporting requirements should reflect banks business models and risk profiles			
60	Risk reporting should provide a forward looking assessment of risk			
Principle 9 – Clarity and Usefulness				The DCAM capabilities required to support Principle 6 (adaptability) are the same as those needed to enable Principle 9
61	Risk reports need to be meaningful to stakeholders and contribute to sound decision making			
62	Risk reports should include a balance between risk data, analysis and interpretation			
63	Reporting policies and procedures should recognize differing needs of consumers			
64	The BOD should ensure that it is receiving reports that align with internal risk reporting and compliance obligations			
65	BOD should alert senior management when risk reports are not providing the right level of information needed for risk monitoring			
66	Senior management should ensure that it is receiving relevant information			
67	Bank should develop an inventory and classification of risk data items			
68	Risk reports should be clear and useful with an appropriate balance between data, analysis and conclusions			
69	Bank should confirm with recipients that the information aggregated and reported is relevant and appropriate			
Principle 10 - Frequency				
70	Bank should assess the frequency requirements for each report and test its ability to produce in all circumstances			
71	Some reports on credit, market and liquidity position and exposure reports are needed intraday			
Principle 11 - Distribution				
72	Procedures should be in place to allow for rapid collection and analysis of risk data			
73	Bank needs to periodically confirm that relevant recipients receive timely reports			