Applied A.I. Solutions

Foundations of Data Management

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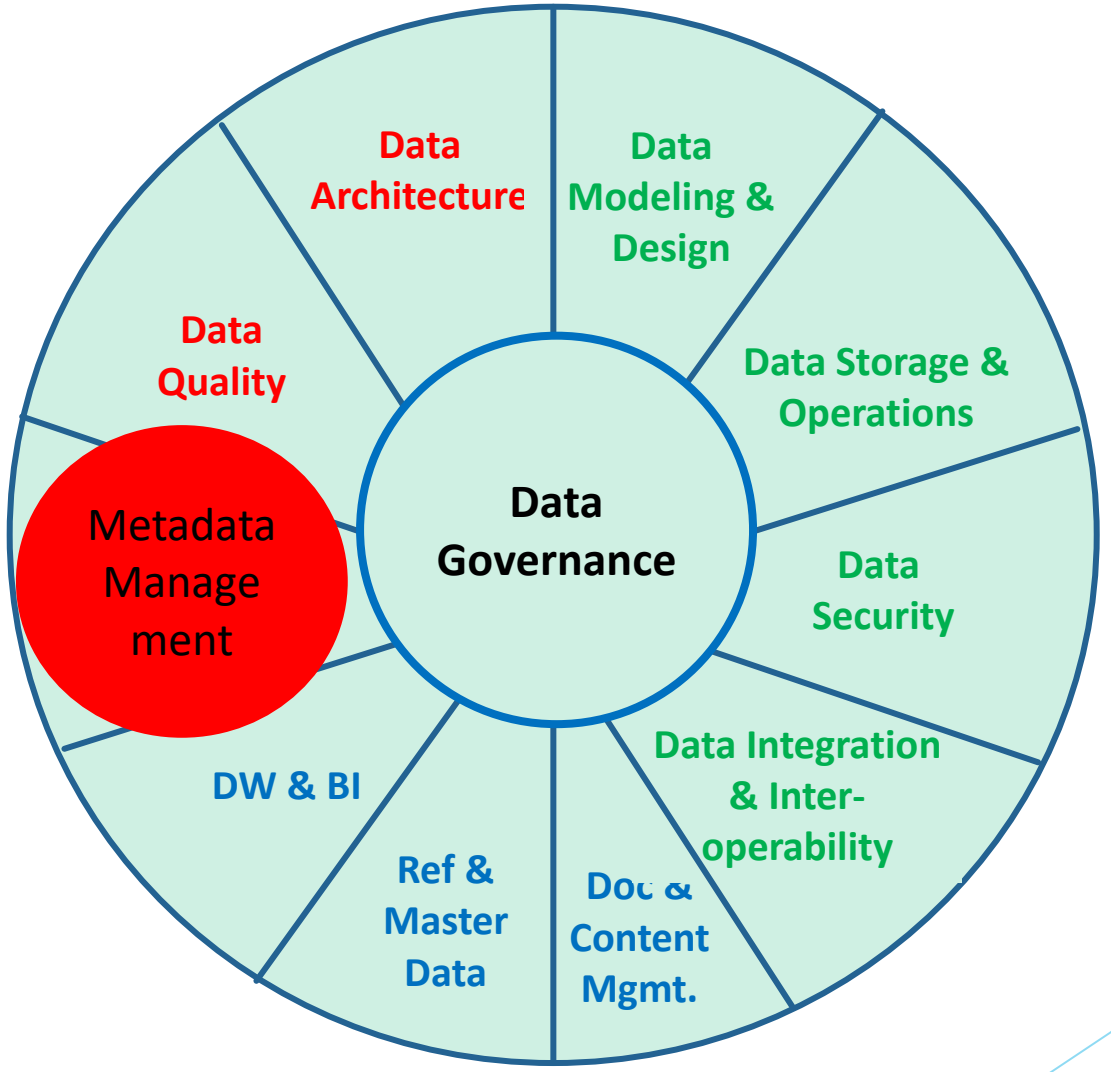
METADATA MANAGEMENT

The DAMA Wheel



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1. INTRODUCTION

- Metadata is data about the asset (data)
- Metadata represents the context, information and knowledge about the data that we need to manage
- Metadata helps to interpret data in a meaningful way
- Metadata originates from a range of processes related to data creation, processing, and use, including architecture and governance

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MM Framework

Definition

Planning, Implementation, and Control activities to enable access to high-quality, integrated metadata

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Goals

1. Provide organizational understanding of business terms and lineage
2. Collect and integrate metadata from diverse sources
3. Provide a standard way to access metadata
4. Ensure Metadata Quality and Security

Business Drivers

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MM programs are guided by the following principles:

- Organizational commitment
- Strategy
- Enterprise perspective
- Socialization
- Access
- Quality
- Audit
- Improvement

https://www.gartner.com/doc/reprints?id=1-24L1M1LE&ct=201112&st=sb

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Inputs

- Business requirements
- Metadata issues
- Data architecture
- Business metadata
- Technical metadata
- Operational metadata
- Data governance metadata

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Activities

1. Define metadata strategy
2. Understand metadata requirements
3. Define Metadata architecture
   - Create metamodel
   - Apply metadata standards
   - Manage metadata stores
4. Create and maintain metadata
   - Integrate metadata
   - Distribute and deliver metadata
5. Query, report and analyze metadata

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Deliverables

1. Metadata strategy
2. Metadata standards
3. Metadata architecture
4. Metamodel
5. Unified metadata
6. Data lineage
7. Impact analysis
8. Dependency analysis
9. Metadata control process

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Suppliers	Participants	Consumers
• Business data stewards • Data managers • Data governance bodies • Data modelers • Database administrators	• Data stewards • Project managers • Data architects • Business analysts • System analysts	• Application developer analyst • Data integrators • Business users • Knowledge workers • Customers, collaborators • Data scientists • Data journalists

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Technical Drivers

Techniques

- Data lineage and impact analysis
- Metadata for Big Data ingest

Tools

- Metadata repository management tools

Metrics

- Metadata coverage scorecard
- Metadata repository contribution
- Metadata usage reports
- Metadata quality scorecard

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Drivers

- Increase confidence in data
- Increase the value of strategic information
- Improve operational efficiency
- Improve communication between data consumers, IT professionals
- Prevent the use of out-to-date or incorrect data
- Create accurate impact analysis thus reducing risks
- Support regulatory compliance

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Essential Concepts

1. Metadata vs Data
2. Type of Metadata

Business Metadata	Technical Metadata	Operational Metadata
• Definitions, descriptions of data sets, tables and columns • Business, transformation rules, calculations • Data Models • DQ rules, measurements • Data update schedules	• Physical database table, column names, properties • Access permissions • Data CRUD • Physical data models • Models, assets relationships • ETL job details • File format schema definition	• Job execution logs (batch) • History of extracts • Schedule anomalies • Audit results • Error logs • Reports, query access, frequency, execution time

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3. Metadata Registry Standard (ISO/IEC 11179)

- Framework for the generation and standardization of data elements
- Basic attributes of data elements
- Rules and guidelines for the formulation of data definitions
- Naming and identification principles for data elements
- Registration of data elements

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) https://www.iso.org/standard/60341.html

4. Metadata for Unstructured Data

- Descriptive
- Structural
- Administrative
- Bibliographic
- Record Keeping
- Preservation Metadata

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5. Sources of Metadata

- Application metadata repositories
- Business Glossary
- Business Intelligence Tools
- Configuration management Tools
- Data Dictionaries
- Data Integration Tools
- Database management and System Catalogs
- Data Mapping Management Tools
- Data Quality Tools
- Directories and Catalogs
- Event messaging Tools
- Modeling Tools and Repositories
- Reference Data Repositories
- Service Registries
- Other Metadata Stores

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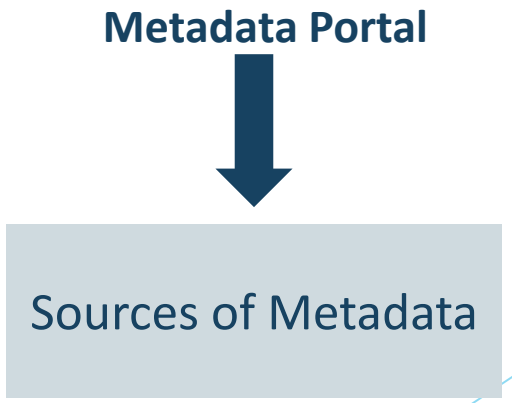
- Distributed Metadata Architecture

  A single access point – (centralized)

  Pros:
  - Metadata always current, valid
  - Queries are distributed, improving performance
  - Simpler automated metadata query processing
  - No metadata replication or synchronization processes

  Cons:
  - Additions to Metadata are not supported
  - Limited standardization
  - Query limitations by source systems availability
  - Metadata quality depends on source systems



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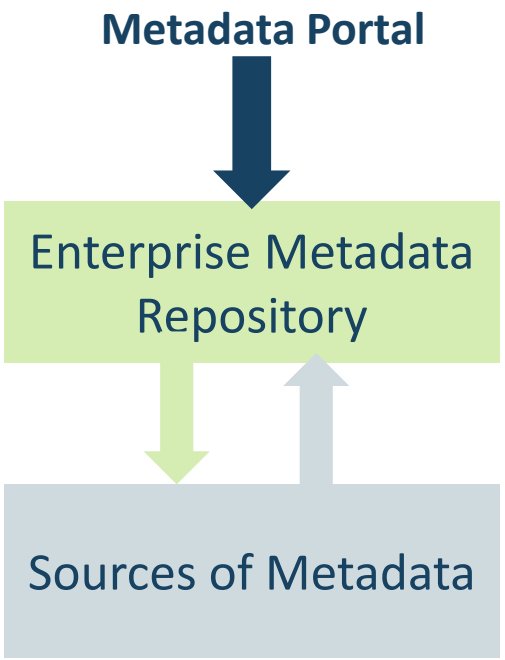
6. Metadata Architecture

- Centralized Metadata Architecture

  A single Metadata repository (distributed)

  Pros:
  - High availability
  - Quick Metadata retrieval
  - Improved quality database structures
  - Extracted Metadata enhancement

  Cons:
  - Complex processes
  - Costly Maintenance



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- Hybrid Metadata Architecture
  - Combines Centralized and Distributed architectures
  - A repository design only accounts for user-added Metadata, and critical standardized items

Pros:

- Near real-time retrieval of metadata from its source
- Enhanced metadata
- Reduced manual IT interventions and custom-coded functionality

Cons:

- Limited availability from source systems
- Increased overhead to get metadata results from the central repository

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2. ACTIVITIES

a) Define Metadata Strategy

- Initiate Metadata strategy planning
- Conduct key stakeholders interviews
- Assess existing metadata sources and information architecture
- Develop future Metadata architecture
- Developed a phased implementation plan

b) Understand metadata Requirements

- Volatility, synchronization, history, access rights, structure. integration, maintenance, management, quality, security

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c) Define Metadata Architecture

- Create a Metamodel (data model for metadata)
- Apply Metadata standards
- Manage Metadata Stores (repository environment)

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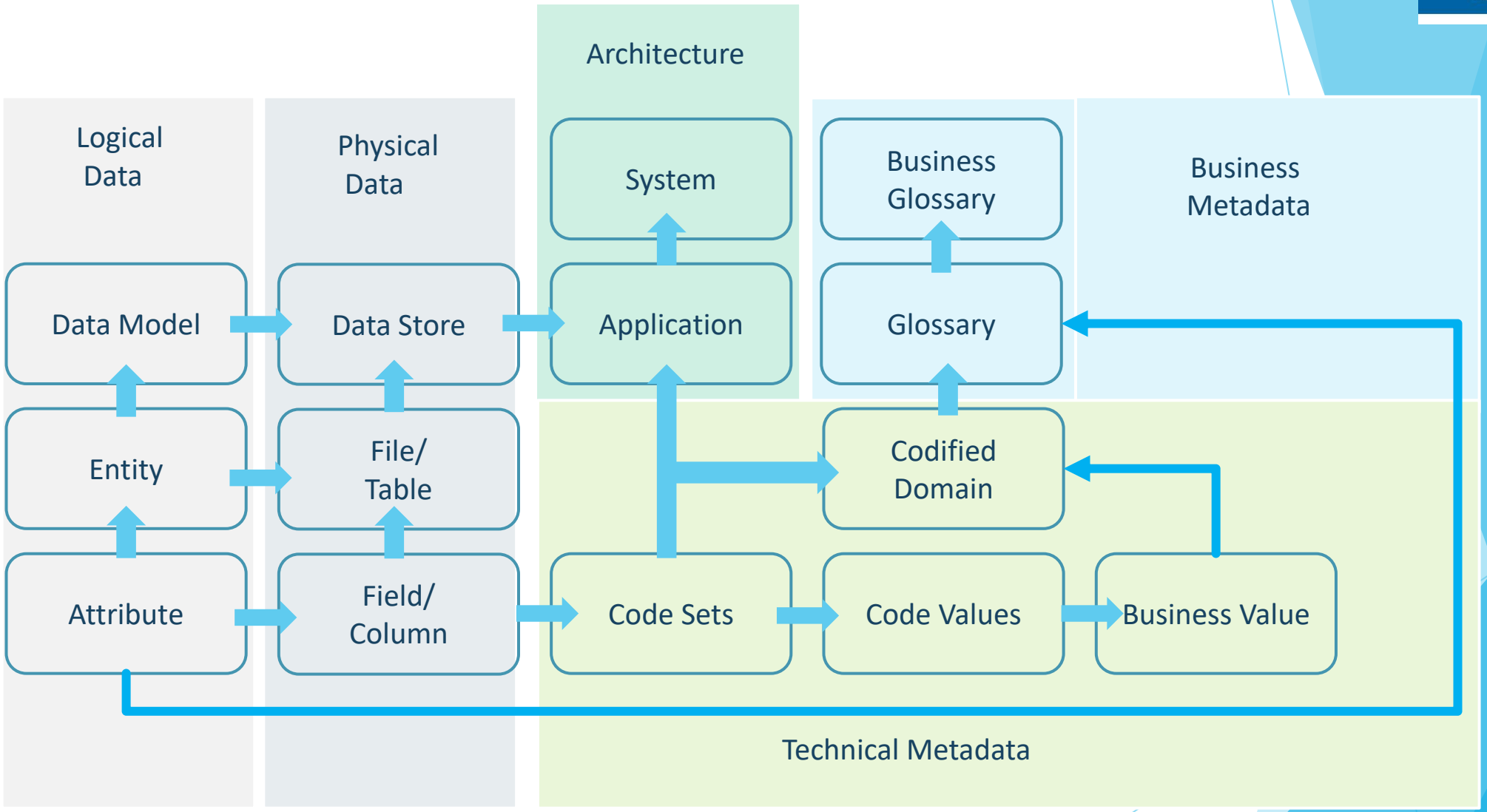
Example Metadata Repository Metamodel



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c) Define Metadata Architecture

- Create a Metamodel (data model for metadata)
- Apply Metadata standards
- Manage Metadata Stores (repository environment)

d) Create and Maintain Metadata

- Integrate
- Distribute and Deliver Metadata

e) Query, Report, and Analyze Metadata

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3. TOOLS

- Metadata Repository management Tools

4. TECHNIQUES

- Data Lineage and Impact Analysis
  - Implemented Lineage
  - Designed Lineage
  - Lineage discovery
    - Business Focus
    - Technical focus
- Metadata for Big Data Ingest

Magic Quadrant

Figure 1. Magic Quadrant for Metadata Management Solutions

Source: Gartner (November 2020)

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5. IMPLEMENTATION GUIDELINES

- Readiness Assessment / Risk Assessment
  - Error in judgement
    - Incorrect, incomplete or invalid assumptions
    - Lack of knowledge about the context of the data
  - Exposure to sensitive data
  - SMEs retention

- Organizational and Cultural Change
  - Senior Management Commitment

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6. METADATA GOVERNANCE

- Process Controls
- Documentation of Metadata Solutions
- Metadata Standards and Guidelines
- Metrics
  - Metadata Management Maturity
  - Metadata repository availability and completeness
  - Metadata Usage and Business Glossary Activity
  - Metadata documentation quality

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