

Two Best Practices for Effective Metadata Management for Data Warehousing and Business Intelligence

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Summary

This note provides information managers with guidance on how to select the most effective approach to metadata management in support of data warehousing and business intelligence projects.

Overview

Key Challenges

- Enterprises that do not pay adequate attention to metadata management in strategic data warehousing (DW)/business intelligence (BI) projects will find that they are ill-equipped to support the demand of business users.
- Information management (IM) professionals struggle to evolve their metadata management practices to an enterprise discipline.

Recommendations

- Select your metadata management approach to DW/BI based on a variety of critical areas. These factors include: business readiness, discipline readiness, scope of effort, timing and risk issues, and technology and metadata integration factors.
- As the discipline of DW/BI matures, metadata sharing and integration will become increasingly important:
 - Focus your metadata management efforts in these critical areas.
 - Align your metadata management practices to leverage metadata across the enterprise.

Introduction

Metadata management is a key component to the success of DW/BI initiatives. When metadata is managed within the confines of the DW/BI project, its focus is to serve the needs of the DW/BI users. However, when information about the data (that is the metadata) is sought, to be shared with other programs such as business process management or master data management, then the focus of DW/BI appears limited and the metadata assets have to be managed differently and holistically; thus metadata management has to evolve to an enterprise-level program — enterprise metadata management.

The Three Levels of Metadata Management Approaches: Limited, Moderate and Robust

Based on Gartner customer inquiries, we are seeing the vast majority of organizations doing metadata management for DW/BI in a "less than optimal" manner. Most start out with a "limited" set of metadata management capabilities and technologies — with a focus on the tactical need to implement DW/BI projects quickly. Over time, the users tend to become more advanced and want more "moderate" metadata services, such as integrated reporting on the definition of their data, metadata lineage and the rules used when transforming data from operational systems when loading the data into the warehouse.

Ultimately, to satisfy evolving business needs for better understanding and management of information assets, many organizations eventually decide they need to implement a more "robust" form of metadata management for DW/BI to be better aligned with (and utilize) other disciplines using a more formal, standardized enterprisewide approach to metadata management. See ["Overcoming the Challenges to Implementing Enterprise Metadata Management Across the Organization"](#) and ["Best Practices in Enterprise-Class Metadata Management Capabilities."](#)

This research provides guidelines and best practices for information managers to decide how to select an appropriate starting point for metadata management in support of DW/BI, and when to consider migrating from one common

approach (such as *limited* metadata management) to another (such as *moderate* or *robust* approaches). Due to a variety of factors, most organizations will start with a limited approach to metadata management and evolve to a moderate (good enough) one — never fully achieving robustness for all DW/BI metadata due to factors involving business readiness; metadata management discipline readiness; scope of effort, timing and risk factors; and technology and integration costs and challenges. (See the Recommended Reading section for additional research on the topic of metadata management.)

Analysis

Select Your Metadata Management Approach to DW/BI From a Variety of Key Factors

Few, if any, organizations start their DW/BI initiatives using robust metadata management discipline or tools. Most start with limited metadata management services and evolve them to become more moderate or robust. However, the ability to evolve the discipline of metadata management is constrained by (or enabled by) the organizations' maturity and robustness, involving four key factors: business readiness; discipline of metadata management readiness; scope of effort, timing and risk issues; and technology and metadata integration and sharing.

Limited approaches to DW/BI tend to focus on implementing solutions without concern for longer-term (more mature) metadata management practices involving the four key factors. As DW/BI users mature and their needs evolve, the demand for better metadata management services will require a *moderate* approach to metadata management, where the key factors are correspondingly mature enough to be able to properly do moderate metadata management. Eventually, many organizations will find a need for a more *robust* approach to metadata management, which will require more maturity, in terms of the key factors to succeed. Thus, there is a sliding scale of metadata management maturity, running from *limited* to *robust*, which requires that the organization synchronizes the corresponding sliding scale of key factors in order for metadata management to be successful.

Visualizing the Mapping of Key Factors to Metadata Management Approaches

Table 1 outlines a number of key factors that will influence the most appropriate course of action to take with metadata management. While the table is limited to three approaches, you will probably discover that you have requirements that spread across all three. In this case, you must either choose a single "best-fit" approach (which could leave some users waiting for metadata management to evolve, in order to fully satisfy their specific requirements); or you must use different approaches for different aspects of DW/BI. Most organizations will decide to use the "start with less" approach, and incrementally add more robustness as the user needs and the discipline of metadata management matures within the organization. Generally, most will settle into some hybrid of the *moderate* approach to metadata management for DW/BI.

Table 1. Mapping Key Factors to Metadata Management Approaches			
Key Factors Impacting the Metadata Management Approach	Limited Metadata Management Approach	Moderate Metadata Management Approach	Robust Metadata Management Approach
<i>Business-Readiness Factors</i>			
Business Metadata Management-related Pain and Opportunity	Limited	Moderate	High
Metadata Management Return on Investment	Limited	Moderate	High
Business Sponsorship/Commitment	Limited	Moderate	Fully Engaged/Committed
Degree of User Clout	Limited	Moderate	High

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Business Urgency of Need	Low	Moderate	High
<i>Metadata Management Discipline Readiness Factors</i>			
EIM/DW/BI Discipline Maturity	Immature	Maturing	Mature
Metadata Management Discipline Maturity	Immature	Maturing	Mature
Metadata Standardization Needs	Individual Projects	DW/BI Standard	Multi-Discipline Standard
Metadata Management Governance, Risk Compliance Needs	Siloed DW/BI GRC	Shared DW/BI GRC	Multi-Discipline GRC
Consistency of Business Glossary of Terms	Nonexistent/Limited	Moderate	Cross-enterprise Standard
Existing Sources of Metadata	Many But Inconsistent	Moderate and More Consistent	Moderate and Consistent
Analytical Resources Availability to Metadata Management	Limited Availability	Moderate Availability	Fully Available
Staffing Resources and Training Budget	Limited	Moderate	Large
<i>Scope of Effort, Timing and Risk Factors</i>			
Breadth of Organizations Needing Support	Limited	Moderate	Wide
Breadth of Roles Needing Support	Limited	Moderate	Wide
Breadth of Use Cases Needing Support	Limited	Moderate	Wide
Metadata Management Change Impact on Business Processes	Low	Moderate	High
Breadth of Application	Limited	Moderate	Wide

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Key Factors Impacting the Metadata Management Approach	Limited Metadata Management Approach	Moderate Metadata Management Approach	Robust Metadata Management Approach
Touchpoints			
Metadata Management Change Impact on IT Processes	Low	Moderate	High
Time Needed to Deliver New Metadata Management Services	Short	Moderate	Long
Project Solution Delivery versus Metadata Management Importance	Solution 90%, Metadata Management 10%	Solution 65%, Metadata Management 35%	Metadata Management Critical to Solution
Organizational Risk/Failure Tolerance Level	Low	Moderate	High
<i>Technology and Metadata Integration Factors</i>			
Availability of Metadata Management-Enabling Technologies	None/Limited	Moderate for DW/BI	Advanced/Enterprisewide
Degree of Available Metadata Integration	Non-integrated, Tool-specific	Cross-DW/BI Tool Integration	Enterprisewide
Software Budget	Limited	Moderate	Large
BI = business intelligence; DW = data warehousing; EIM = enterprise information management; GRC = governance, risk and compliance			

Source: Gartner (March 2013)

We suggest that Table 1 be used as a template. Firstly, map your current environment, secondly, map the short-term needs of the DW/BI initiatives, then thirdly map the longer-term needs of the DW/BI initiatives. It may be helpful to be clear about what is truly a business need, rather than a business want.

The objective is to come up with three "footprints" mapping out the gap between the current metadata management practices (Footprint 1); the short-term (Footprint 2); and the long-term DW/BI metadata management needs (Footprint 3). This will help focus on what is needed and when (for example, to identify how quickly the future needs must be satisfied). You are focusing on how to close the gap between current practices and short-term needs; but it may make better business sense to address some of the long-term issues — that could actually save total time, cost or effort — earlier on in the migration process.

Once you have decided where the footprint lies for each factor, you will want to select the most appropriate metadata management approach to DW/BI. If the footprint for each factor is mostly in the *limited* metadata management approach column, your best approach to metadata management for DW/BI would be a more limited, lightweight version. If the footprint is mostly in the *moderate* metadata management approach column, then the best approach to metadata management for DW/BI would be a more moderate one, and so on. When the footprint is mostly in the

moderate or *robust* column, then you will need to address where some of the factors are not as mature, in support of that approach.

Since the three approaches to metadata management are generally related to enterprise information management (EIM) maturity, it is difficult to meet the business needs when the footprints are widely dispersed across those three columns. For example, your business users may desire enterprisewide standardization and governance of terms and definitions of data; but unless EIM has matured within the organization to have enterprisewide shared terms and governance, and descriptions of shared data and metadata, it would be inadvisable to try to impose a robust approach for metadata management for DW/BI. In this case, it is better to focus on an adequate (good enough) footprint in the *limited* approach column or the *moderate* approach column, and close the gap for DW/BI (or all the enterprise disciplines, for that matter) through an evolutionary metadata management strategy, moving toward the *robust* approach column.

Looking At Four Key Factors Affecting the Metadata Management Strategy in Depth

Business readiness. Unless business managers and users see the value of metadata management, support it, and can quantify its return on investment in improved business outcomes, efforts to implement or improve metadata management will ultimately fail. The good news is that DW/BI initiatives generally have sound business drivers behind them. However, business users are often immature in terms of understanding their metadata management needs for DW/BI; so they tend to ask for more metadata services once they develop and understand the implications. This frequently means starting DW/BI using a limited approach to metadata management, then waiting to see whether their needs and readiness for metadata management (caring and supporting it) evolve before committing to a moderate or robust approach prematurely.

Metadata management and discipline readiness. Are information managers ready and able to deliver the necessary level of metadata management? Aside from skill, knowledge and time, and tool availability issues, there are constraining factors that might make information managers unable to deliver the necessary services at the levels desired. For example, the levels of discipline of EIM, DW/BI or metadata management may be too immature to do so. Another major hurdle affecting these disciplines is governance. How do you perform moderate or robust metadata management, without a single version of the truth in the data warehouse and existing agreed standardization of terms (in a business glossary), across the organization — used to provide common definitions of information assets and their use? Metadata management efforts will be constrained to more "siloed," redundant or inconsistent versions of information assets (as in the *limited* approach to metadata management).

Even if the data is consistent, it is possible that the metadata regarding that data is not. When there are nonexistent or many inconsistent sources of metadata — especially if there are no well-defined governance rules about when the metadata can change — you must either use a robust approach to metadata management (to ideally solve this problem) or the *limited* approach to metadata management, with conflicting definitions must suffice. It is generally better to begin with a *limited* approach, which will help expose semantic conflicts and inconsistencies — and can improve the quality and understanding of the DW/BI data from an "as-is" perspective — than to jeopardize the success of metadata management by getting caught up in the resolution of conflicts and inconsistencies.

This is also the case when IT and other business units that have the analytical requirement to document the metadata are unavailable, due to other priorities, or where there is inadequate metadata management staffing or training budget to support the initiative.

Scope of effort, timing and risk factors. When metadata management opportunities arise that involve a large number of organizations, roles, use cases, applications, and changes to processes and methodologies, the risk of failure, coordination and collaboration needs, and time to deliver the services drastically increase. It is advisable to start using a *limited* approach until metadata management becomes more established and mainstream in terms of process and methods.

Technology and metadata integration factors. Suffice it to say that since most of the metadata in organizations exists in a machine-readable format, the ability to integrate DW/BI technologies — such as data modeling/database design, extraction transformation and loading (ETL) and BI tools — housing information about the data in the warehousing environment will be a critical aspect of whether or not organizations can, or should, use a given approach to metadata management at a specific point in time. (We will address this in more detail in the next section.)

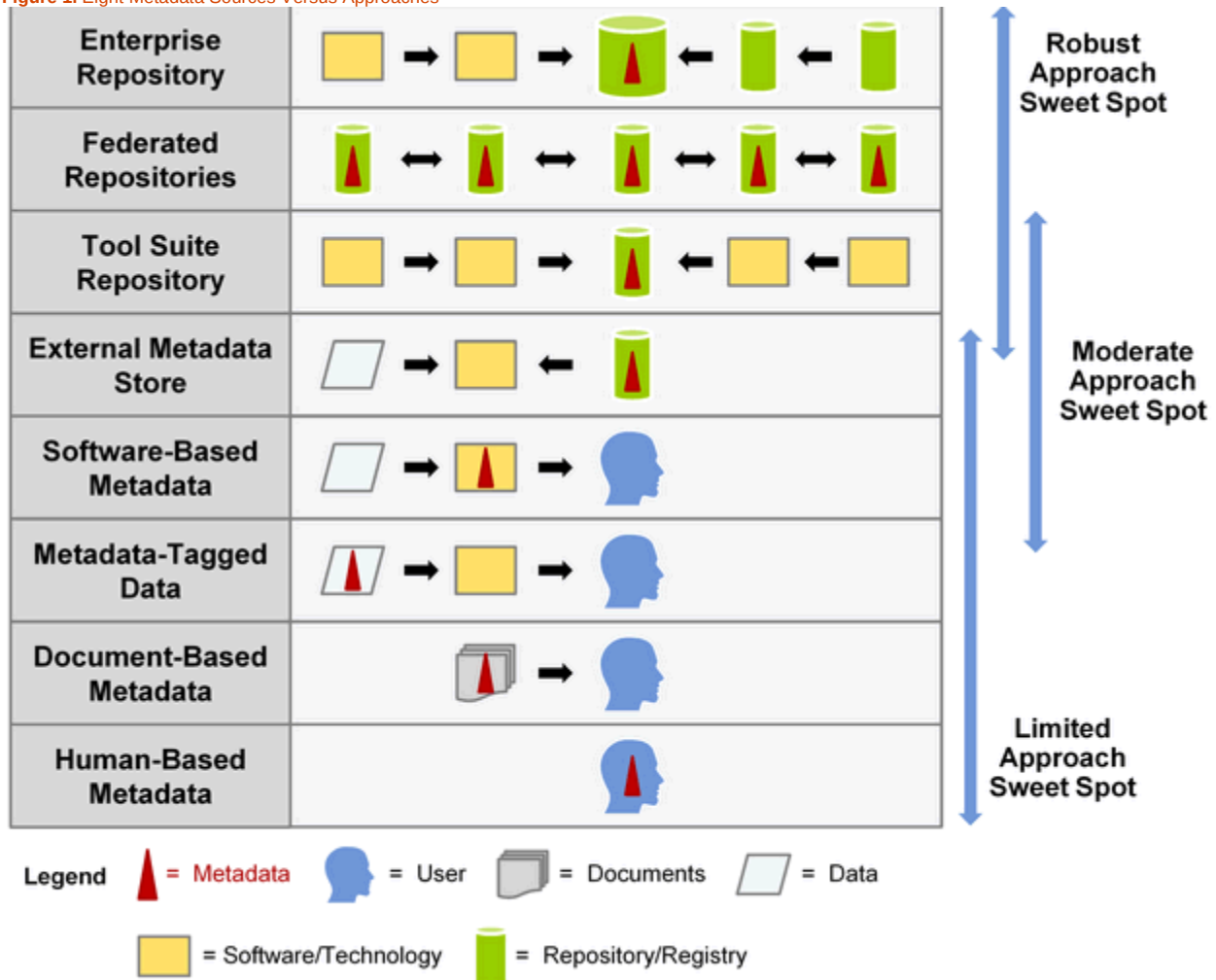
Focus on Evolving Technology and Metadata Integration While Your Approach to Other Key Factors Matures

Since most metadata exists in machine-readable formats and metadata management is a technology-enabled discipline, a key component of a metadata management strategy should include metadata integration across different technologies and sources.

Sources of Metadata for Federation and Consolidation

In "The Eight Common Sources of Metadata" (and also Figure 1) we describe eight sources of metadata which range from personal knowledge (in the head of a business user or IT professional), through metadata stored in individual tools, to federation across tools and consolidation into an enterprisewide/corporate metadata repository.

Figure 1. Eight Metadata Sources Versus Approaches



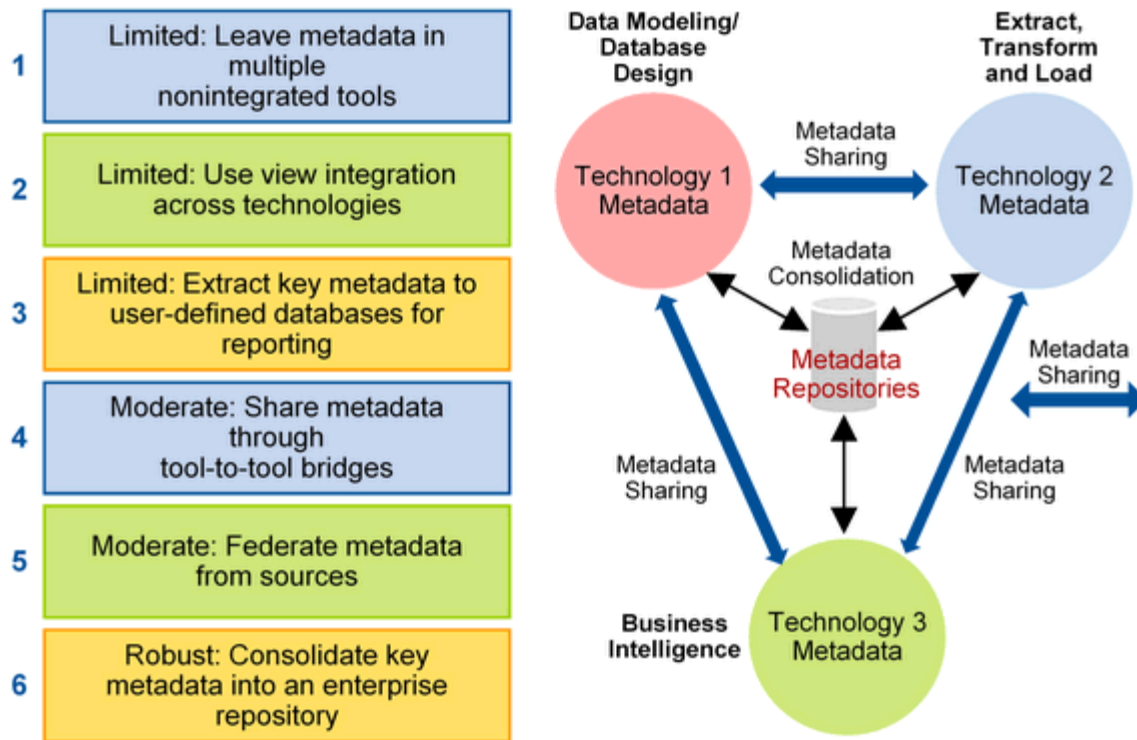
Source: Gartner (March 2013)

Based on Gartner customer feedback, initially we see limited approaches to metadata management for DW/BI. These tend to start with metadata "where it exists today;" for example, Microsoft Word, PowerPoint and Excel documents, workgroup environment and individual business and IT modeling tools, databases and DW/BI tools with little or no consistency or integration of the metadata. The discipline of metadata management tends to be immature for initial DW/BI projects and stays there until the demands of DW/BI users drive attention and commitment to moving metadata management to more moderate approaches.

Approaches to DW/BI Federation and Consolidation

A *moderate* approach to metadata management requires expanding beyond the Limited Approach to the sharing of metadata to include greater metadata integration through federation or consolidation — usually involving the metadata repositories of single vendor tool suites — the best-of-breed DW/BI repositories are able to support multiple vendors — or use of an enterprisewide/corporate repository which includes a subset of capabilities for DW/BI metadata management. (In addition to supporting other types of disciplines and tools, as depicted in Figure 2. See also "[Six Common Approaches to Metadata Federation and Consolidation.](#)")

Figure 2. Six Common Approaches to Metadata Federation and Consolidation



Source: Gartner (March 2013)

Limited Solution

Organizations typically start at Level 1, using a *limited* approach to metadata management by leaving metadata in many non-integrated tools. They may augment this through the use of naming standards that allow users viewing metadata in one technology (like a data element description in a data modeling tool) to use that name to look into the ETL or BI tools for more information about that asset.

As they become more mature, organizations may move to the "better" *limited* Level 2, adding a Web browser that looks across the DW/BI tools; or to Level 3, which moves some metadata to user-defined databases for reporting.

Moderate Solution

Level 4 necessitates a more *moderate* approach to metadata management, since sharing the metadata through tool-to-tool bridges requires a greater degree of sophistication than most organizations can initially master — particularly if the tools are from different vendors with different underlying information models, security, versioning and configuration management, which must be resolved through human analytics as part of the bridges. However, beware that single vendor solutions may claim to be integrated to a tool suite repository but actually have the same issues as multi-vendor tool solutions due to each tool having its own models and versions.

Robust Solution

Level 5 is still nearly attainable at the *moderate* approach level when using a (truly) single vendor integrated tool suite, or through the use of a best-of-breed repository focused on DW/BI technologies. However, most of the DW/BI tool suite and best-of-breed repositories are incapable of addressing the needs of *robust* metadata management — especially in terms of supporting other components of the Gartner Business Analytics Framework or other disciplines

supported by a Level 6 enterprisewide/corporate repository. (See "[Decision Framework for Evaluating Metadata Repositories](#)" and "[Toolkit: Sample RFI and Vendor Rating Spreadsheet for Evaluating Metadata Repositories](#)" for more information.)

As you approach Level 5, make sure to prioritize, align and leverage your DW/BI projects to contribute to enterprise metadata management for other disciplines based on compound business value-add and the likelihood of mutual increased success through sharing.

In terms of aligning their approach to the discipline of metadata management, with technology metadata integration, most organizations will find they should start with a limited approach, using low levels of metadata federation and consolidation, and move as rapidly as possible to Level 4 or 5 over the ensuing two-year period. Most will never reach Level 6 — and a majority of those who do, will selectively bridge metadata from their Level 5 tool suite or best-of-breed repositories into their Level 6 enterprise repository on an "as-needed" basis. There are numerous reasons for this:

1. Fully-functional and enabled enterprise metadata repositories can cost upward of \$1 million — just for the software — making it prohibitive.
2. Since metadata is pervasive across disciplines and roles, the sheer scope of consolidating all metadata is impractical — better to consolidate the subset of metadata which makes the most business sense.
3. Since most federation or bridging of metadata across technologies (including repositories) is a semi-automated operation involving analytics, there are issues related to availability of analytical resources, currency of metadata between the sources, and the target for consolidation and introduction of errors in the process.
4. Cross-repository governance issues grow substantially (for example, who owns the consolidated metadata and how to keep the sources in sync, and the rights to changing the sources in relation to each other as they impact consolidation).

Many organizations will find having a limited subset of metadata — federated across multiple repositories or consolidated into an enterprise repository — is a necessary component of their enterprise metadata management strategy. However, the vast majority of DW/BI initiatives will find this something to evolve toward, rather than achieve, in order to support their users' needs. It is generally pragmatically better to let those responsible for enterprise metadata management resolve this issue at a future date, as cross-discipline user metadata management demands and a willingness to address these demands surfaces.

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