



MATERIALS MASTER DATA

IN THE ERA OF INDUSTRY 4.0

A Maturity Model Framework

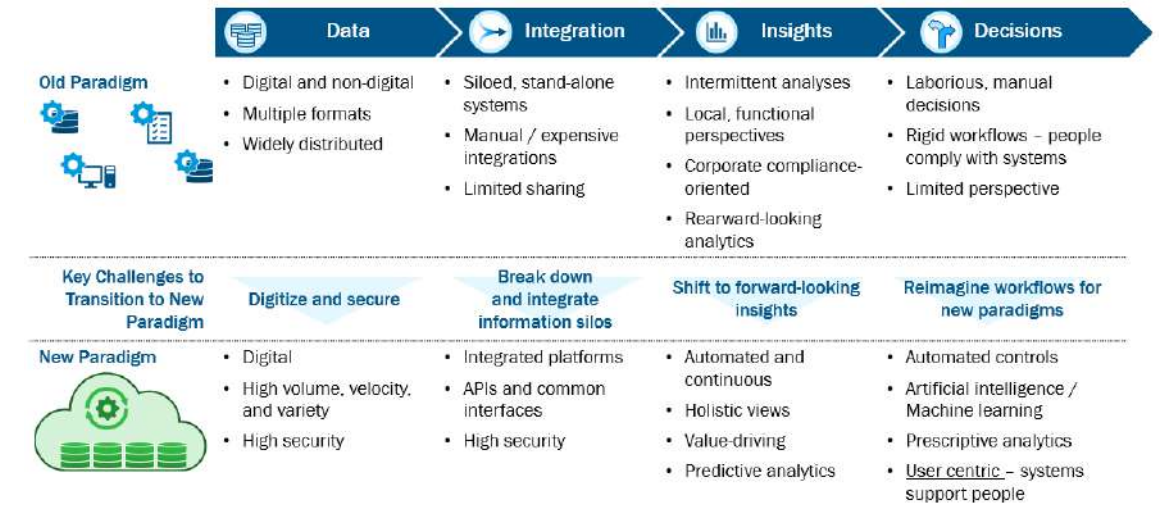


INTRODUCTION

Successfully realizing the benefits of Industry 4.0 requires organizations to break down silos and rework decision-making models. The evolution of how data has been managed in the past to where we are now offers huge potential for Materials Master Data Management in Maintenance, Repair & Operations (MRO).

In the early days, organizations had access to some data, managed in various formats, which was distributed across organizational silos. Integrating all sources of data was expensive and lacked automation. In addition, leveraging that data was laborious and could only be used to make very limited decisions.

Successfully realizing the benefits of Industry 4.0 requires breaking down silos & reworking decision-making workflows



The advent of Integrated Risk Management (IRM) derived from Industry 4.0 technologies is enabling teams to work together in ways never before possible. And it's paying off. By integrating departmental technologies, teams can pool information to support more effective MRO, improve the supply chain and quickly find spare parts in case of an emergency. Now companies can have more control over decision-making processes with smarter, more efficient, more comprehensive sources of information, and machine learning is supporting decisions that previously required a human brain. With all of this information, companies can use data-driven insights to act at a global level.

There is potential value in these kinds of insights from the materials Master Data Management perspective. Manufacturers are changing their models because of the digital revolution to focus more on services vs. supply. The Internet of Things (IoT) has the ability to enable a service-driven, just-in-time spare-parts model.

In fact, according to McKinsey & Co., *the evolution of technology to support better decision-making in supply chain, procurement and maintenance could result in up to **40% savings** in inventory purchases.*

But to take advantage of the benefits and potential savings, manufacturers and end users need to make sure they can interact. That's why industry is making investments in the ISO 8000 standard, which includes plotting the interoperability of spare parts. Now manufacturers can make the part, provide the data and supply it to all the people who use that spare part without end users or distributors needing to manually key in data. Saudi Arabia, for example, which is well-known for embracing innovation, is demanding ISO 8000 data be supplied anytime something is sold to its government.

The industry is not far from realizing Materials Master Data Management and leveraging this business process as a competitive advantage. But like any digital transformation, this is a journey. It requires bringing in the right teams, agreeing on the process, developing a program to manage process change and effectively implementing it across the business. For organizations looking to develop digital strategies to optimize MRO, Industry 4.0 technology can enable a far more efficient process that reduces the time needed to search for spare parts while maintaining accurate, accessible and reliable data.

» **Where is your organization in the journey to Materials Master Data maturity?**

Sphera's free Materials Master Data self-assessment tool can be used to help organizations identify their level of maturity when it comes to employing the latest technologies for Master Data Management as well as offer opportunities for improvement. This should help underpin any MDM digital strategy.

For the purpose of this framework, "Materials Master Data Management" describes the processes and technology systems used to help firms standardize, manage and report on materials data, and the tool could also be used to model the maturity of data management systems to support services and finished goods.

Materials Master Data Management
Should Be Evaluated Across **Eight Dimensions** »»

»» DEFINED STANDARDS

Many organizations are saddled with multiple enterprise resource planning (ERP) systems or legacy databases that produce variations of data to represent their inventory. Defined data standards are necessary for improving maintenance and managing spare part spending, but many organizations have nonexistent or poorly defined

taxonomies to guide inventory data entry. And some details can only be accessed via disparate documents or spreadsheets. Companies with more comprehensive strategies will incorporate an ISO 22745-compliant technical dictionary with the ability to add granularity to support standards compliance.





➤➤ MATERIAL DATA QUALITY

Asset-intensive operators require a lot of material spare parts to safely and efficiently maintain and repair their assets to maximize production, but they don't need to go overboard in ordering spare parts stock either. Operators with basic systems suffer from acquiring costly duplicate spare parts. More mature

operators will manage a single catalog of materials linked to the manufacturer's part numbers. Descriptions are built automatically, and materials are fully compliant to the defined data standard, which reduces duplication and ensures supersession and obsolescence is effectively managed and up to date.

➤➤ BILL OF MATERIALS

Many organizations have fragmented approaches to managing their bill of materials. This could mean MRO materials are not linked to an asset, equipment or maintenance task. The problem? Engineers and materials specialists cannot work together to leverage the power of bills of materials (BoMs). A more comprehensive approach enables operators to develop

asset and functional data hierarchies that mirror the physical plant while integrating maintenance to the material government process. In addition, this helps ensure all relevant materials are linked to assets and maintenance tasks and the risk of not having spare parts and materials on hand would be clearly understood.





➤ GOVERNANCE

Organizations with basic approaches to governance tend to employ either local or uncontrolled data entry. Sometimes requests for updates are emailed to a specialist who manually updates the ERP according to written rules. Manual updates to spreadsheets, too, are often cumbersome and unwieldy. More advanced

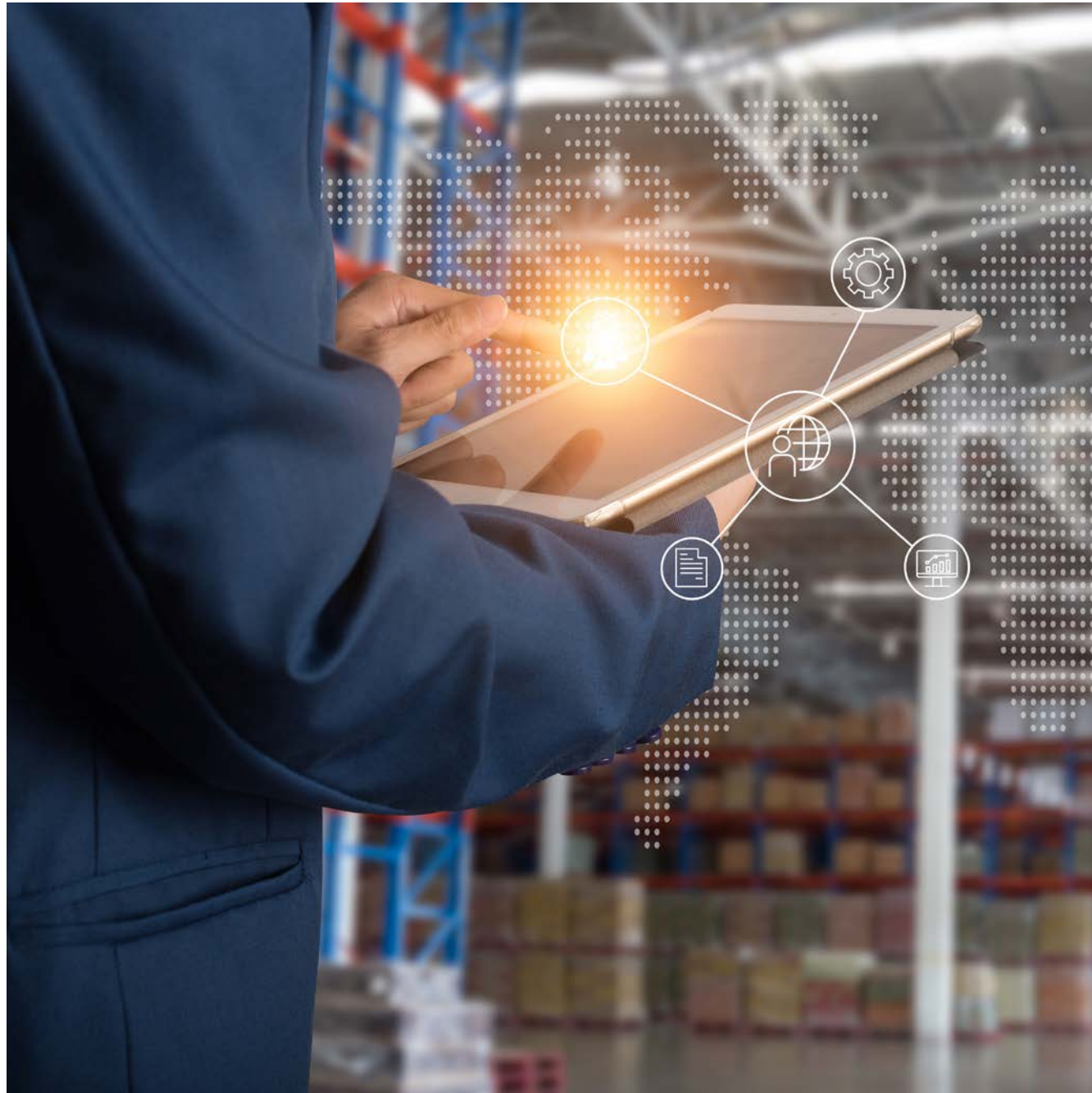
strategies to manage data governance use online forms with variable and enhanced workflows and feed data back into the ERP system of record. This ensures descriptive quality, prevents duplicates and helps to ensure group data rights for varying levels of technical authority.

»» SEARCH

According to industry research, most operators spend over 30% of their time searching for critical spare parts. With hundreds and thousands of inventory line items to wade through during spare parts retrieval, it's necessary to deploy intelligent solutions so operators can quickly access what they need and when they need it to maintain and repair their critical equipment. No longer will search be restricted to local plants or ERPs

support the need to access spare parts quickly. Operators need capabilities to search across their enterprise and ensure they are seeing a complete source of truth with data integrated across enterprise systems. This ability to expose previously restricted data and access a single source of truth makes for improved decision-making to help ensure maintenance efficiency and smart purchasing.





➤ INVENTORY OPTIMIZATION

Most larger firms already use commercial-ready software to manage their inventories. However, the more basic approaches only support individual sites with little to no visibility of other sites' data. With this incomplete amount of information, it is nearly impossible to extract and analyze MRO data, so manual reporting is necessary. And in many instances, operators are managing complex supply chains with multiple vendors servicing the same inventories.

Organizations with more mature strategies aggregate and report on inventory, spending and materials usage across assets via a single application. In addition, they drive effective inventory reduction and spend rationalization programs by holding inventory only when necessary, based on stock level analysis and operational risk assessments. And they have strong supply chain management structures inclusive of vendor managed inventory.

»» SUPPLIER CATALOG

There are clear limitations for operators who are without links between supplier catalogs in their e-procurement hubs and the materials master. Excessive spend is the result of duplicate MRO inventory between ERP and the suppliers'

catalogs. Firms with more thorough supplier catalog management, match them with their Materials Master Data and ERP systems. And they automatically process data and trigger approvals for supplier price increases.





➤ CAPITAL PROJECTS

Inadequate management of MRO data that originates during capital projects could result in unstructured data, duplicates and costly inventories. Therefore, asset-intensive operators need to be wary of third parties creating materials data for their capital projects. Firms with more

sophisticated processes require suppliers to enter materials data into their online governance portal to ensure standards compliance. In addition, they assess the need for additional spares in the context of usage and industry benchmarks, which minimizes inventory waste.

MATERIALS MASTER DATA SELF-ASSESSMENT PROVIDES INSIGHT TO MOVE UP TO THE NEXT LEVEL

Based on over 20 years of engagement with senior executives looking to structure, govern and analyze their material data, this study identifies eight dimensions against which Materials Master Data Management programs can be measured. Firms display different levels of performance against these eight dimensions depending on their level of maturity that can be found in **figure 1** (right).

| | 1 FRAGMENTED | 2 IMPROVED | 3 ENHANCED | 4 INTEGRATED | 5 INTELLIGENT |
|------------------------|--|---|--|--|--|
| DEFINED STANDARDS | Nonexistent or poorly defined taxonomy to guide data entry. E.g., each class has the same characteristics. Only available in documents or spreadsheets. | Taxonomy to describe materials consists of item classes and sets of characteristics based in the item class. Available in a shared database. | List values and field restrictions defined for each attribute in the context of the class. Translations of all dictionary terms available in required operating languages. | ISO 22745-compliant technical dictionary, fully accessible online for use in related applications. Attribute Units of measure are held separately allowing interdependent rules. | Material Specification Types used to add granularity to standards compliance. Automated scoring based on multiple aspects of the data while maximizing productivity. |
| MATERIAL DATA QUALITY | Descriptions have been created as free text based on local practices. Duplicates are widespread, even at the same plant. | Taxonomies have been used to build descriptions, but there are many versions in use. Part numbers are a mixture of supplier, OEM and manufacturer versions. | All materials have been cataloged from a single taxonomy to create a functional description. These are linked to one or more Manufacturer Part Numbers. | Descriptions are built automatically based on a sophisticated rules engine that handles language variation and material types. | All materials are fully compliant to the defined data standard with no duplication across the enterprise. Supersession and obsolescence is managed and up to date. |
| BILL OF MATERIALS | MRO materials are not linked to any asset, equipment or maintenance tasks. Search via BOM is not possible. | MRO materials can be linked to a maintenance or equipment BOM, but there is little governance of the BOMs once created. | Processes are established for the management of materials, including part supersession and obsolescence. | Asset hierarchy is actively maintained and available online with BOM maintenance integrated to material governance processes. | Functional hierarchy maintained to mirror physical plant with all relevant materials linked to assets or maintenance tasks. |
| GOVERNANCE | Either local, uncontrolled data entry or requests for updates emailed to a specialist who manually updates the ERP according to written rules. | Spreadsheet templates, often based on macros and electronic lookups, are completed and submitted to processing teams for upload to the ERP. | Online forms are used with a generic or home-grown MDM application to provide the semblance of governance, but with quality still based on user skill levels. | Specialist web applications used to ensure descriptive quality, prevent duplicates and group data rights for different levels of authority. | All operations are managed using online forms with variable and optimized workflows. Data integration to ERPs is two-way with sophisticated error handling. |
| SEARCH | Search restricted to local plant or ERP with success based on knowledge and experience of data. | Operators able to search across enterprise but inconsistent data and poor search engines undermine the value of the results. | Free text search across multiple indexed fields supported by filtering based on key characteristics of search results. | Search available on mobile devices and directly within ERP pages in multiple modes to reflect user preferences. Creation of lists for passing to ERP. | Search results integrated to other enterprise systems with ability to expose restricted data external to the enterprise based for pooling. Single source for all decision-making data. |
| INVENTORY OPTIMIZATION | Inventory managed in local silos without visibility to other sites. Nearly impossible to extract and analyze MRO data. Manual report building is common. | Key inventory data are properly maintained in transactional systems and decision-making criteria established and understood. | Up-to-date inventory, spending, and materials usage data is aggregated from all ERPs and available in a single, web-based application. | Specialized reports based on normalized data allow MRO category managers to drive effective inventory reduction and spend rationalization programs. | Inventory only held when necessary with stock-level analysis based on Operational Risk assessments. Extensive use of vendor managed inventory with reliable lead times. |
| SUPPLIER CATALOG | No links between supplier catalogs in e-procurement hub and material master. Duplication of MRO items between ERP and catalog leads to excessive and uncontrolled spend. | Supplier catalogs are managed in spreadsheets by teams trying to find matches to the material master. Manual load processes cause delays and inefficiency. | Supplier catalogs are routed through your MDM system with intelligent parsing and matching to ensure better data quality and establish links to ERP material masters. | Supplier catalog updates are processed automatically, triggering workflows as needed to seek approvals for price increases and other significant changes prior to publication. | Suppliers can load and maintain price books directly using a secure online portal, assisting buyers in categorization of new catalog items. |
| CAPITAL PROJECTS | Materials data for capital projects is created by third parties without regard to your corporate standards. | Material lists are provided in standardized spreadsheets, but with little quality control and no integration to your operational ERP. | Suppliers are mandated to enter materials data in an online governance portal, providing standards compliance and visibility of progress. | Interim stock control is integrated to materials data staging systems and offline bulk processing available through Excel client application. | Material recommendations for existing spares assessed in the context of previous usage and industry benchmarking. Handover to operations minimizes inventory wastage. |

Corporations are using many different strategies to manage their Operational Risk information.

We define the **five maturity phases for information management** to be:

➤➤ PHASE 1: **FRAGMENTED**

The first and lowest level of maturity is characterized by data being managed by paper forms and site-level documents without access for stakeholders across the organization. While paper-based processes may enable firms to satisfy minimal

compliance requirements, there are clear limitations on such approaches. Data collected manually or in spreadsheets also often fall short on data quality because of challenges in applying tight quality controls.

➤➤ PHASE 2: **IMPROVED**

Firms in the second phase of maturity have made targeted deployments of specialized software solutions to manage specific areas of their Materials Master Data. These organizations are benefiting from greater automation of data management and reporting processes, enabling staff to redirect their time to more valuable activities. But, companies

at Phase 2 of maturity will have a patchwork of point software solutions and spreadsheet-based systems in place. The problem? When multisite companies use a plethora of systems for materials data management, it results in the use of multiple, sometimes manual, methods of aggregating and reporting on unstructured data.

➤➤ PHASE 3: ENHANCED

In the third phase, organizations are using a range of specialist software to manage materials data at most of their sites. Purchasing, maintenance and supply chain managers can get a firmwide view of key information by extracting data from different software systems and running analysis

in spreadsheets. At Phase 3, data is centralized around specific processes, but there are still data silos because software systems are run separately, without links between systems. For example, data governance is not automatically fed back into the ERP system.

➤➤ PHASE 4: INTEGRATED

Firms in the fourth phase of maturity are using integrated platforms for managing Materials Master Data. Moving to Phase 4 often requires some IT system rationalization and investment in IT integration services to enable the flow of data between different systems. What are the

benefits? Using a centralized platform makes data management and reporting more time efficient. MRO category managers can also use integrated platform to base decisions on a better understanding and view of inventory levels.

➤➤ PHASE 5: INTELLIGENT

Companies at the cutting-edge of Materials Master Data Management are running strategies to not only reduce the risk impact associated with spare parts, including stock outs and budget management, but also to increase the productivity

of plants. In the fifth phase, organizations are using integrated information management that incorporates data from multiple systems to help managers get a true, real-time view of inventory levels and needs.

HOW CAN I MOVE TO THE NEXT MATURITY PHASE? ➤➤

We recommend that procurement, supply chain and maintenance managers first use this maturity model to diagnose their existing level of maturity for each of the eight areas and then identify a target phase of maturity for the next two years. While some companies might want to achieve enhanced inventory levels and structured, governed inventory data, this target maturity level might not be realistic for all organizations. Companies can also use the results of the maturity model to identify information management weaknesses that should be tackled to support higher performance in Materials Master Data Management.



MAINTENANCE, REPAIR AND OPERATIONS

Materials Data Maturity Model – Self Assessment Tool

Sphera helps asset-intensive operators improve decision-making and performance with the ability to structure, visualize and manage Materials Master Data.

Digitally enabling the complex processes around data quality and governance is an essential element of both materials management and risk management in the 21st century. Assessing the maturity of your MRO materials data management will help you to identify opportunities for improving current performance and drive Industry 4.0 digital strategy.



Start Your Self-Assessment Now:

<https://sphera.com/tools/master-data-management-maturity-assessment>

ABOUT SPHERA

Sphera is the leading global provider of Integrated Risk Management software and information services with a focus on Environment, Health, Safety & Sustainability (EHS&S), Operational Risk and Product Stewardship. Sphera has advanced Operational Excellence for more than 30 years, serving companies and customers across the globe to create a safer, more sustainable and productive world.



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