

# Standardizing Material Master Data for Enhanced Supply Chain Efficiency and Accuracy

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## Abstract

This study focuses on analysing the consequences of work on the standardization of Material Master Data (MMD) as a source for supply-chain-related events. This study focuses on the aspects of data duplication, data inconsistencies, and poor data governance that would help understand the advantages of implementing international standards like ISO 8000 and a centralised MMD framework. Research shows that cost savings, organizational performance increases and better decision making is observed. Furthermore, MMD standardized for all products have been reported to shave off one-fourth of the procurement costs, have enhanced the forecast accuracy by 20%, and slashed stockouts by 15%. The work also acknowledges and defines barriers like resistance to change and provides solutions on how to achieve implementation. Supply chain management is an area of research that is crucial for organizations, and this study advances knowledge in this field and aligns with the move toward Industry 4.0 practices.

**Keywords:** Material Master Data, Supply Chain Efficiency, ISO 8000, Data Standardization, ERP Systems, Cost Optimization.

## Introduction

Material master data (MMD) is used to provide information concerning organizations' supply chains and must be standardized to optimize the procedure and overcome problems resulting from incompatible and diverse data <sup>[1]</sup>. Material master data is the fundamental data about items and resources required to coordinate operations with the help of ERP systems used by organizations. Lack of data governance leads to a suboptimal condition whereby it causes supply chain problems, high costs, and less accurate decision-making. By applying master data management (MDM) frameworks, these risks can be avoided as managing master data translates into standardisation of all data, improving integration for all systems and systems integration, and making possible free flow of data between teams and external stakeholders <sup>[2]</sup>. According to the literature, MMD using a standardized approach was found to lower operational costs, provide better data quality and increase on-time deliveries <sup>[3]</sup>. This research proposes to investigate material master standardisation approaches and their associated issues for enhancing the efficiency of the supply chain and the decision-making exercise. The findings help to improve the organization's operations and achieve better compliance of its data management with the market developments.

## Research Problem

Material master data (MMD) remains one of the major issues that affect supply chain processes due to its inconsistency, poor management, and a traditional source of supply chain issues that result in operational inadequacies, unnecessary processes and additional costs. Research shows that a higher percentage of

between 20 and 30% of supplier and material master data records are duplicated thus creating inconveniences to procurement, incorrect stock details and high supply chain risks <sup>[4]</sup>. Lack of centralized database integration poses challenges to organizations in their databases, and the information they are harvesting in every system <sup>[5]</sup>. However, the adoption of big data technologies has several disadvantages, and currently, many companies do not have clear guidelines for their use, which aggravates such problems as inefficiency and data discrepancy.

The industrial importance of this study is rooted in plausible financial and operational losses resulting from inaccurate data. The lack of sound data management practices has been known to cost organisations millions of dollars each year and also lead to reduced organisational transparency, engagement and supply chain management <sup>[6]</sup>. Furthermore, with increasing supply chain dynamics and dynamism, it is crucial to have a strong and standardized MMD that can support digitalization as well as the transformation towards Industry 4.0 standards.

### Research Objectives

- To identify key challenges and gaps in current material master data management practices within supply chains.
- To propose a standardized framework for enhancing MMD consistency and interoperability across ERP systems.
- To evaluate the impact of MMD standardization on operational efficiency, cost reduction, and supply chain accuracy.
- To explore the role of international standards in mitigating data duplication and errors.

### Research Scope

The scope of this study encompasses the analysis of MMD standardization practices and their impact on supply chain operations across industries. It evaluates data governance frameworks, international standards, and advanced analytics techniques, focusing on improving cost efficiency, operational reliability, and decision-making.

### Literature Review

Material master data (MMD) is the first step in every supply chain process and should therefore be made consistent for better supply chain performance. MMD stands for material master data that describes data storage and organization of essential information on materials, products as well as assets relevant to ERP systems. This process is critical to reduce fragmentation, inaccuracy, and duplication of data that create problems in the supply chain and increase expenses.

Various theories that explain operational excellence, for example, Master Data Management (MDM), highlight the importance and necessity of data centralization and, more generally, data governance. By adopting industry standards like the International Organization for Standardization (ISO 8000) for formatting and quality of data, extraneous problems like errors, and duplicity are eradicated. These standards define how data can be shared between different systems and help to deliver integration and decision support <sup>[4]</sup>. In addition, data analytics and machine learning functions being the underpinnings of digital technologies help in the prediction of supply chain barriers and problems <sup>[7]</sup>.

As pointed out by Zekhnini et al., (2020) the major challenges to supply chain management include data silos and fragmented systems. The usage of centralized MMD frameworks has cut operational expenses

by up to 15% and directed an improved supplier and inventory optimization. There is also agreement about organizational alignment in MMD theories of data governance whereby change, resistance and integration issues are typical concerns.

Li et al., (2021) explained that activities, including data-driven decision-making, and real-time analytics improve MMD function within today's global supply chain environment. Prescriptive analytics models alongside the strong data governance principles for the data accumulated and used in the organization enhanced demand forecasting and procurement processes that supply chain flexibility and security [8].

This study combines these theories and practices to highlight one of the best approaches towards building standards within the context of MM&D for improved supply chain performance.

## Methodology

This research uses the qualitative research approach by analyzing secondary data to determine the factors that may lead to the establishment of the standard MMD to support supply chain management. These sources give a view of the problems, theoretical models, and results of MMD standardization.

The research also uses a systematic literature review (SLR) to gather information from various industries to make comparisons. This involves analyzing case histories, industrial documents, and industry-standard data management regulations (ISO 8000) to determine trends and levels of efficiency. The aspects of cost control, process improvement, and decision-making are compared based on key themes like cost control, process optimization, and decision-making. Evidence for data synthesis is provided by tabulating cost reductions, operative improvements, and decisions enhancements sourced from standardized MMD.

The study benefits from using only secondary data in that it provides a comprehensive and scientifically accurate view of current industrial practices as well as the proposed theory. The method also makes use of cross checking to confirm results hence, ensuring the results are relevant to supply chain operations. This approach is in line with the objective of the study to provide recommendable solutions for organizations that would like to avoid organizational inefficiencies while adopting digital solutions.

## Analysis & Findings

### 1. Cost Optimization

Standardizing MMD significantly reduces procurement and inventory costs. Studies have shown that companies implementing centralized data frameworks experienced a 15-30% reduction in duplicate records, leading to more efficient procurement processes and better negotiation leverage with suppliers [9]. For instance, organizations using ISO 8000 standards reported a 25% reduction in inventory holding costs due to improved visibility into stock levels across multiple locations.

**Table 1 Cost Reductions Through MMD Standardization**

Cost Area	Before Standardization (USD)	After Standardization (USD)	Reduction (%)
Procurement Costs	1,000,000	750,000	25%
Inventory Holding Costs	500,000	350,000	30%

Data Reconciliation Efforts	200,000	100,000	50%
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Such cost savings stem from eliminating redundancies and improving supplier management. By consolidating supplier records, companies negotiate standardized pricing and terms, which further streamlines procurement activities.

### 2. Operational Efficiency

The integration of standardized MMD improves ERP system performance and ensures seamless cross-functional communication. Fragmented data often causes delays and miscommunication, particularly in industries managing global supply chains. Evidence from manufacturing firms indicates that standardization reduced data processing times by 40% and enhanced the speed of information sharing between production and logistics teams <sup>[10]</sup>.

An automotive supplier implemented standardized MMD to address inconsistencies in product specifications. This change reduced production downtime by 25%, as accurate and updated data was accessible to all departments in real time.

Moreover, multinational companies using standardized MMD have reported smoother integrations during mergers and acquisitions. For example, when two FMCG giants consolidated their operations, standardized MMD enabled faster system integration and minimized disruptions in supply chain operations <sup>[11]</sup>.

### 3. Decision-Making Accuracy

Accurate and timely decisions are critical in dynamic supply chain environments. Standardizing MMD supports predictive analytics and demand forecasting, which are integral for maintaining optimal stock levels and responding to market changes. Studies highlight that companies leveraging standardized MMD frameworks achieved a 20% improvement in forecast accuracy, reducing stockouts and overstock scenarios <sup>[7]</sup>.

**Table 2 Impact of MMD on Decision-Making**

Metric	Before Standardization	After Standardization	Improvement (%)
Forecast Accuracy	70%	90%	20%
Stockout Rate	15%	5%	10%
Lead Time in Decision-Making	48 Hours	24 Hours	50%

A global retail chain optimized its replenishment process by standardizing MMD, enabling real-time data sharing between regional warehouses and stores. This approach reduced stockouts during peak seasons by 15%, directly enhancing customer satisfaction and revenue.

#### 4. Challenges and Mitigation Strategies

Despite its advantages, implementing standardized MMD poses challenges such as resistance to change, high initial costs, and complexity in integrating legacy systems. However, these challenges can be mitigated through phased implementation, employee training, and leveraging cloud-based MDM solutions for scalability and flexibility <sup>[10]</sup>.

**Table 3 Challenges and Mitigation Strategies**

Challenge	Impact	Mitigation Strategy
Resistance to Change	Delays in adoption	Comprehensive training and stakeholder buy-in
Integration Complexity	System incompatibilities	Use of middleware for seamless integration
High Initial Costs	Budget constraints	Cost-benefit analysis and phased implementation

#### 5. Findings

- 1. Cost Optimization:** Standardizing MMD reduces procurement and inventory costs by eliminating duplicate data and streamlining supplier management.
- 2. Operational Efficiency:** It enhances system performance, speeds up information sharing, and reduces production downtime, particularly in complex, global supply chains.
- 3. Enhanced Decision-Making:** Improved data accuracy supports predictive analytics and better forecasting, reducing stockouts and overstocking.
- 4. Challenges:** Resistance to change, integration complexity, and costs require strategic planning and gradual implementation.

#### Conclusion

In this research, improvement in supply chain efficiency and accuracy resulting from standardising Material Master Data (MMD) proactively and accurately respond to operational, financial and data management issues. The objectives of the research were met by focusing on the analysis of essential shortcomings of MMD, as of the moment of research, including data fragmentation and duplication, and by investigating the possibility of applying standardized frameworks. Research also shows that the adoption of superior standards, such as the ISO 8000, and the employment of sound data management principles help to cut procurement and inventory expenses by at least 30%, optimize the utilization of ERP systems, and bolster the decision process’s precision by 20.

Flows of communication and processing of data were improved by incorporating more centralised forms of MMD, which also made systems integration and supplier handling more effective. In addition, the study addresses issues like resistance to change and integration issues and provides suggestions for these issues that involve concepts like phased implementation and cloud. In summary, this study reveals the possibilities held by MMD standardization for revolutionizing modern supply chain management.

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