# Logical Data Model

Course: DMDD  
 Team: Group 1  
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### **Team Members**

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### **Access to Submitted Artifacts**

Google Drive Folder: <https://drive.google.com/file/d/1C70PKGGoWWQS4qCkzSFW3AUyaQmm8BBw/view?usp=sharing>  
GitHub Repository:<https://github.com/riyanshikedia10/DMDD_Group-1>

## **Overview**

This document presents the finalized logical data model designed for our project, refined using instructor feedback from the initial submission. The revised model enhances accuracy, normalization, business workflow representation, and relational clarity. The goal of this design is to support traceability, order processing, supplier integration, and inventory control in a scalable and maintainable manner.

## **Instructor Feedback Response Summary**

The instructor raised two major concerns:

1. Materials were not clearly associated with their suppliers.
2. Customer ordering processes were not clearly represented in the model.

Additionally, there was a requirement to provide the logical model instead of a conceptual one, with strict enforcement of primary keys, foreign keys, and normalization rules.

All of these issues have been directly addressed in the design changes described below.

## **Improvements Made to the Initial Data Model**

### **1. Materials and Supplier Relationship Clarified**

We introduced a new associative entity to connect materials with their respective suppliers. This change ensures clear visibility into which supplier provides each material and supports effective procurement and traceability.

### **2. Customer Ordering Process Fully Defined**

The data lifecycle from product selection to order fulfillment is now clearly structured. Orders, cart functionality, order items, and product references are properly normalized and linked. This enables accurate tracking of what customers purchase, how items are priced, and how they are later processed and shipped.

## **Normalization and Data Structure Enhancements**

The model now adheres to Third Normal Form (3NF):

• All attributes are atomic, with no repeating or multivalued fields.  
 • Surrogate primary keys are applied where required to remove partial dependencies.  
 • No transitive dependencies exist between non-key attributes.

One documented exception is the inclusion of TotalPrice within the Order entity. This small denormalization is justified for historical record accuracy and performance efficiency.

## **Removal of Many-to-Many Relationships**

All many-to-many relationships from the conceptual model have been replaced with associative entities. This ensures relational integrity and prevents ambiguity in transaction data. It also enables the system to properly track inventory, batch sourcing, order quantities, and product lifecycle events.

## **Data Integrity and Enforcement**

To ensure strong structural reliability:

• Primary keys have been added to every entity in the system.  
 • All relational connections now include foreign key constraints.  
 • Cardinalities reflect accurate business participation rules.  
 • Mandatory constraints are included where business logic requires it.

This ensures correct data usage and compliance with relational database standards.

## **Business Workflow Alignment**

The redesigned model now accurately supports essential processes:

Customer → Cart → Order → Payment → Shipment → Reporting and Compliance

Supplier, material sourcing, and product organization workflows are also fully supported. These improvements ensure alignment with real-world traceability and inventory quality-control requirements.

## **Expanded Functional Scope**

Additional entities were added to reflect operational needs found in practical e-commerce and traceability environments, including:

• Supplier and procurement management  
 • Shipment and logistics tracking  
 • Inventory and product batch integrity  
 • Reporting features needed for compliance and analysis

These elements increase the model’s long-term usability and operational relevance.

## **Conclusion**

The submitted logical data model now meets all required standards, including:

• Full normalization to 3NF  
 • No multivalued or composite attributes  
 • No remaining many-to-many relationships  
 • Correct assignment of data types for all attributes  
 • Enforcement of primary and foreign keys  
 • Accurate reflection of required business rules