## **Logical Data Model**

Course: DMDD  
Team: Group 1  
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### **Access to Submitted Artifacts**

Google Drive (ERD and project documents):  
<https://drive.google.com/file/d/1J1_IoqjvjaP98ovyzpJeg-VzLfnNg--E/view>

GitHub Repository:  
<https://github.com/riyanshikedia10/DMDD_Group-1>

### **Summary of Changes and Improvements to the Initial ERD**

Based on instructor feedback, the initial conceptual model has been redesigned into a fully validated **logical data model**. The updated design eliminates redundancy, clarifies business processes, and improves system accuracy and integrity. The major improvements are detailed below:

#### **1. Normalization and Data Quality Improvements**

The logical model has been normalized to **Third Normal Form (3NF)** to ensure that the data structure eliminates anomalies and supports efficient data processing:

* **First Normal Form (1NF):** All attributes now store atomic values with no repeating groups (e.g., no comma-separated phone numbers, no multi-valued fields).
* **Second Normal Form (2NF):** Surrogate primary keys were introduced for junction tables such as ORDERITEM to eliminate partial dependencies.
* **Third Normal Form (3NF):** Transitive dependencies were resolved, such as removing city/state from the customer record. All non-key fields depend solely on the primary key.

A limited, **documented denormalization** was retained for ORDER.TotalPrice to support historical accuracy and performance, which is a justified exception based on business need.

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

All many-to-many relationships were replaced with junction entities to enforce relational integrity.

Examples include:

* ORDERITEM for Order–Product
* CARTITEM for Cart–Product
* REPORT\_ITEM and REPORT\_SHIPMENT for traceability reporting  
   This ensures consistent data usage and prevents duplication during transactions.

#### **3. Strong Enforcement of Primary and Foreign Keys**

All entities now include a primary key, and every relationship is enforced through a foreign key.  
 Crow’s-foot notation has been applied to visually represent cardinality and participation constraints clearly.

#### **4. Alignment to Business Workflows**

Key business processes now have complete and accurate data flows:

* A customer places orders
* Orders consist of multiple order items
* Each item references a valid product
* Products are linked to specific suppliers
* Payments, shipments, and invoices follow the order lifecycle

This supports reliable auditing, reporting, and operational control.

#### **5. Expanded Functional Scope**

The model now includes **23 entities**, reflecting a realistic e-commerce environment with:

* Supplier and procurement data
* Customer and order management
* Inventory and food batch tracking
* Reporting and compliance structures

This greatly broadens system capability and supports future operational scalability.

### **Conclusion**

The revised logical data model meets all required standards:

* Primary keys and foreign keys enforced throughout
* Zero multivalued and zero composite attributes
* All M:N relationships removed
* Full structural normalization achieved (3NF)
* Cardinality and data types correctly defined
* Business rules are properly embedded in the schema

All updated artifacts are available via the provided repository links. This submission is provided by Group 1 as the finalized logical model deliverable.