Phase III: Logical Model Design — CustoVision

Objective

Create a fully normalized data model (minimum 3NF) to support predictive analytics, business intelligence, and data integrity within the MIS framework, ensuring accurate forecasting and actionable insights.

Entity-Relationship Model (ERM)

Key Entities:

- Products (product_id PK, name, category, unit_price)
- Customers (customer_id PK, name, demographics)
- Sales_History (sale_id PK, product_id FK, customer_id FK, sale_date, quantity_sold)
- Forecasts (forecast_id PK, product_id FK, period, amount, model_type, confidence)
- Alerts(alert_id PK, product_id FK, forecast_id FK, alert_date, recommended_qty)
- Customer_Segments (segment_id PK, customer_id FK, label, score)
- Decision_Log (decision_id PK, actor, type, timestamp, payload)
- Inventory_Transactions (inv_txn_id PK, product_id FK, quantity, type, txn_date)

Relationships and Constraints:

- Sales_History → Products / Customers: Many-to-One
- Forecasts → Products: Many-to-One
- Alerts → Products / Forecasts: Many-to-One
- Customer_Segments → Customers: One-to-One or One-to-Many
- PK uniqueness, FK integrity, NOT NULL on mandatory fields

Normalization

- 1NF: Atomic attributes; no repeating groups.
- 2NF:Non-key attributes fully dependent on PK.
- 3NF:No transitive dependencies.
- Result:Minimal redundancy, high integrity, analytical readiness.

BI and MIS Considerations

- Fact Tables: Sales_History, Forecasts.
- Dimension Tables: Products, Customers, Customer_Segments.
- Aggregation:Daily, weekly, monthly sales/forecasts.
- Slowly Changing Dimensions:Customer_Segments tracked via Type 2.
- Audit: Alerts & Decision_Log ensure accountability.

Assumptions

- One sale per product per customer per day.
- Forecasts computed per product per period.
- Alerts trigger when predicted demand > stock + safety margin.
- Decision_Log records all managerial actions.

Conclusion

The logical model ensures accurate prediction, actionable insights, and accountability. It supports BI reporting, inventory planning, customer segmentation, and decision-making while maintaining data integrity, normalization, and scalability for future analytics.