# Low-Level Design Document for Power BI Project

## Introduction

This document provides a detailed low-level design (LLD) for the Power BI dashboard implementation for ElectroHub. It outlines the data model, ETL process, DAX calculations, and visualization details for an optimized and efficient reporting solution.

## Data Source Details

- \*\*Primary Data Source\*\*: SQL Database (Sales, Orders, Products, Customers, Discounts)  
- \*\*Other Data Sources\*\*: CSV/Excel files (Promotional Data, Additional Attributes)  
- \*\*Data Connectivity\*\*: Direct Query for live reporting, Import Mode for historical analysis

## Data Model (Fact & Dimension Tables)

- \*\*Fact Tables\*\*:  
 - \*\*Fact\_Sales\*\*: Order ID, Product ID, Customer ID, Date, Sales Amount, Profit, Quantity, Discount, Promotion ID  
 - \*\*Fact\_Orders\*\*: Order ID, Customer ID, Order Date, Order Status, Payment Method  
- \*\*Dimension Tables\*\*:  
 - \*\*Dim\_Product\*\*: Product ID, Product Name, Category, Sub-Category, Price  
 - \*\*Dim\_Customer\*\*: Customer ID, Name, Location, Segment  
 - \*\*Dim\_Date\*\*: Date, Year, Month, Quarter, Day of Week  
 - \*\*Dim\_Promotion\*\*: Promotion ID, Promotion Name, Discount Percentage

## ETL Process & Data Transformation

- \*\*Data Extraction\*\*: Connecting to SQL and CSV sources  
- \*\*Data Cleaning\*\*: Handling null values, duplicates, and inconsistent formatting  
- \*\*Data Transformation\*\*:  
 - Merging orders and sales data  
 - Creating calculated columns for profit margin, discount category  
 - Normalizing date formats  
- \*\*Data Load\*\*: Pushing transformed data into Power BI dataset

## Dashboard Components & Visualization Details

- \*\*Top/Bottom 5 Products\*\*: Bar chart showing sales, profit, and quantity sold  
- \*\*Sales Trends\*\*: Line chart displaying daily, monthly, quarterly, and yearly trends  
- \*\*Sales vs. Profit Analysis\*\*: Scatter plot to visualize correlation  
- \*\*Period-over-Period Comparison\*\*: Comparative bar chart based on user-selected dates  
- \*\*Average Discount per Category\*\*: Matrix table for detailed analysis  
- \*\*Total Number of Orders\*\*: KPI card with trend line  
- \*\*Sales by City\*\*: Heatmap for geographical sales distribution  
- \*\*Order-Level Details\*\*: Table with filter options for Product, Date, Customer ID, and Promotions

## DAX Calculations & Measures

- \*\*Total Sales\*\*: `SUM(Fact\_Sales[Sales Amount])`  
- \*\*Total Profit\*\*: `SUM(Fact\_Sales[Profit])`  
- \*\*Total Orders\*\*: `COUNT(Fact\_Orders[Order ID])`  
- \*\*Sales Growth (%)\*\*: `([Current Period Sales] - [Previous Period Sales]) / [Previous Period Sales]`  
- \*\*Top 5 Products by Sales\*\*: `TOPN(5, Fact\_Sales, Fact\_Sales[Sales Amount], DESC)`  
- \*\*Discount Category Calculation\*\*: Using SWITCH() function based on discount percentage

## Security & User Roles

- \*\*Row-Level Security (RLS)\*\*:  
 - Restrict data access by region for sales managers  
 - Limit visibility of financial metrics to specific user groups  
- \*\*Role-Based Access Control (RBAC)\*\*:  
 - Admins: Full access to all reports and datasets  
 - Sales Executives: Access to sales trends and customer details  
 - Regional Managers: Access restricted to assigned regions

## Performance Optimization Techniques

- \*\*Aggregations\*\*: Pre-aggregated tables for fast querying  
- \*\*Incremental Refresh\*\*: Updating only recent data to enhance performance  
- \*\*Optimized DAX Queries\*\*: Using variables and reducing row context iterations  
- \*\*Data Compression\*\*: Removing unnecessary columns and using integer keys

## Conclusion

This low-level design document defines the detailed implementation strategy for the Power BI dashboard at ElectroHub. The outlined approach ensures efficient data processing, insightful reporting, and scalable performance.