BUSINESS INTELLIGENCE SOLUTION DOCUMENT

1. INTRODUCTION

This document outlines the Business Intelligence (BI) solution designed to address key business questions related to sales, customer behaviour, product performance, and inventory management. The solution is based on a structured data model, KPIs, and metrics that will help stakeholders make data-driven decisions.

2. DATA MODEL

The data model is designed to capture the necessary data points from four primary sources: **Inventory Data**, **Sales Data**, **Customer Data**, and **Product Data**. The data model consists of **Fact Tables** and **Dimension Tables** to ensure a robust and scalable BI solution.

2.1 FACT TABLES

SALES (TABLE-1)

Column Name	Data Type	Description	Key Type
ORDER_ID	Integer	Unique identifier for each transaction	PK
STORE_ID	Integer	Identifier for the store	FK
PRODUCT_ID	Integer	Identifier for the product	FK
CUSTOMER_ID	Integer	Identifier for the customer	FK
REGION_ID	Integer	Identifier for the region	FK
TRANSACTION_DATE	Date	Date of the transaction	FK
SALES_AMOUNT	Decimal	Total sales amount for the transaction	Metric
QUANTITY_SOLD	Integer	Quantity of products sold	Metric

2.2 DIMENSION TABLES

PRODUCT (TABLE-2)

Column Name	Data Type	Description	Key Type
PRODUCT_ID	Integer	Unique identifier for each product	PK
PRODUCT_NAME	String	Name of the product	
CATEGORY	String	Category of the product	
SUBCATEGORY	String	Subcategory of the product	
UNIT_PRICE	Decimal	Price per unit of the product	
SALES_PRICE	Decimal	Selling price of the product	
DISCOUNT	Decimal	Discount applied to the product	

CUSTOMER (TABLE-3)

Column Name	Data Type	Description	Key Type
CUSTOMER_ID	Integer	Unique identifier for each customer	PK
CUSTOMER_NAME	String	Name of the customer	
REGISTRATION_DATE	Date	Date when the customer registered	
ACTIVE_STATUS	Boolean	Status of the customer (Active/Inactive)	
PHONE_NUMBER	String	Contact number of the customer	
AGE	Integer	Age of the customer	
GENDER	String	Gender of the customer	
ADDRESS_LINE_1	String	Address line 1 of the customer	
ADDRESS_LINE_2	String	Address line 2 of the customer	
CITY	String	City of the customer	
COUNTRY	String	Country of the customer	
POSTCODE	String	Postal code of the customer	
CUSTOMER_RATING	Decimal	Rating of the customer	

STORE (TABLE-4)

Column Name	Data Type	Description	Key Type
STORE_ID	Integer	Unique identifier for each store	PK
STORE_NAME	String	Name of the store	
REGION	String	Region where the store is located	
CITY	String	City where the store is located	
COUNTRY	String	Country where the store is located	

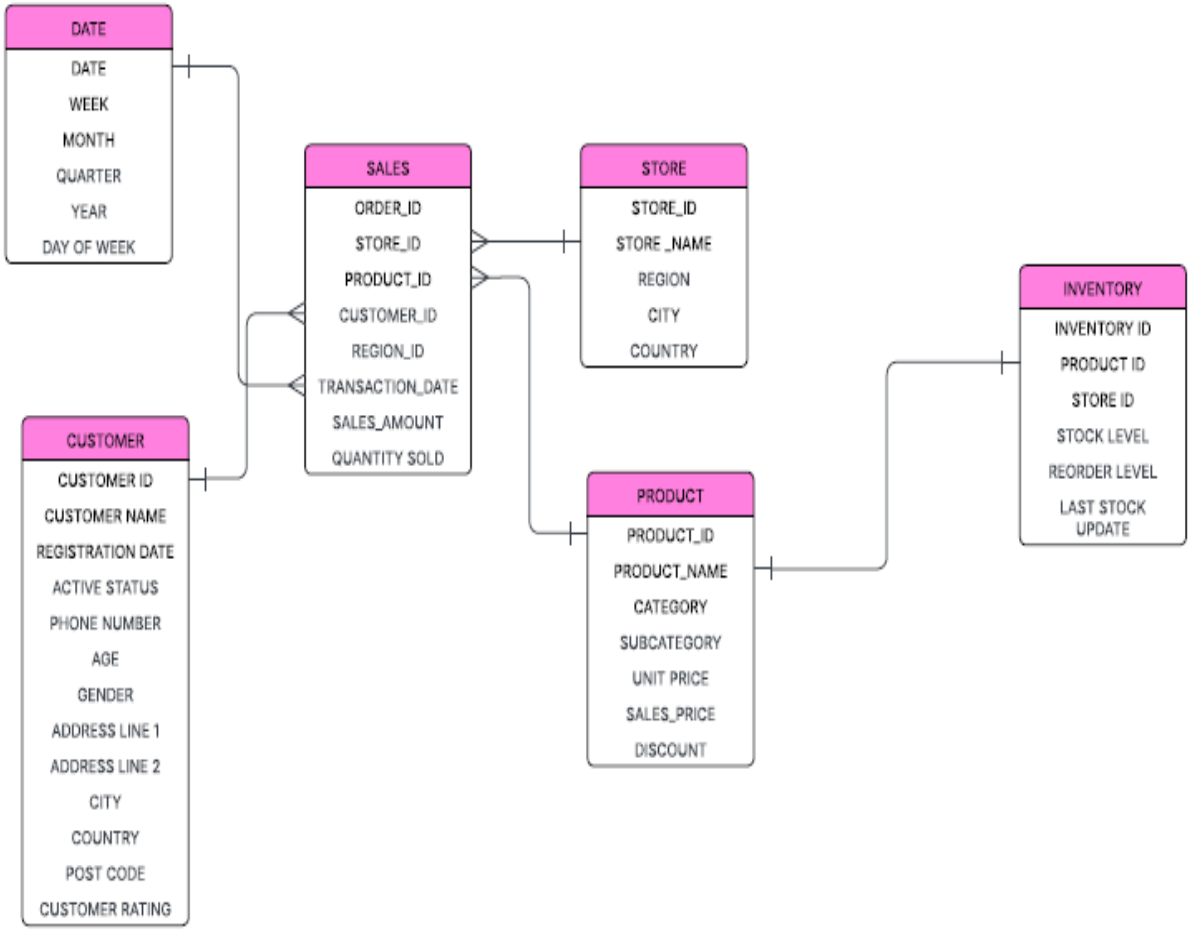
DATE (TABLE-5)

Column Name	Data Type	Description	Key Type
DATE	Date	Date in YYYY-MM-DD format	PK
WEEK	Integer	Week number of the year	
MONTH	Integer	Month number of the year	
QUARTER	Integer	Quarter of the year	
YEAR	Integer	Year	
DAY_OF_WEEK	String	Day of the week (e.g., Monday)	

INVENTORY (TABLE-6)

Column Name	Data Type	Description	Key Type
INVENTORY_ID	Integer	Unique identifier for each inventory record	PK
PRODUCT_ID	Integer	Identifier for the product	FK
STORE_ID	Integer	Identifier for the store	FK
STOCK_LEVEL	Integer	Current stock level of the product	
REORDER_LEVEL	Integer	Minimum stock level before reordering	
LAST_STOCK_UPDATE	Date	Date of the last stock update	

3. ERD DIAGRAM



4. KPIS AND METRICS

The following KPIs and metrics are designed to address the key business questions:

4.1 MONTHLY SALES TRENDS BY STORE/REGION

KPI	Metric	Calculation
Total Sales Amount	SUM(Sales_Amount)	Sum of sales amount grouped by Month, Store, and Region
Sales Growth Rate	(Current Month Sales - Previous Month Sales) / Previous Month Sales	Percentage growth in sales compared to the previous month

4.2 CUSTOMER PURCHASING BEHAVIOR

KPI	Metric	Calculation
Average Order Value (AOV)	SUM(Sales_Amount) / COUNT(DISTINCT Order_ID)	Average value of each order
AOV for Old Customers	SUM(Sales_Amount) / COUNT(DISTINCT Order_ID) for old customers	AOV for customers who have been active for a longer period
AOV for New Customers	SUM(Sales_Amount) / COUNT(DISTINCT Order_ID) for new customers	AOV for customers who have recently registered
Customer Lifetime Value (CLV)	SUM(Sales_Amount) per Customer	Total sales amount generated by each customer over their lifetime

4.3 KEY PRODUCT CATEGORIES

KPI	Metric	Calculation
Sales Contribution by Category	SUM(Sales_Amount) grouped by Product Category	Total sales amount contributed by each product category

4.4 INVENTORY PERFORMANCE

KPI	Metric	Calculation
Stock Turnover Ratio	SUM(Units_Sold) / AVG(Stock_Level)	Ratio of units sold to the average stock level
Top Selling Product	COUNT(Product_ID) grouped by Product_ID	Number of times each product was sold, ordered by the highest count
Understocked Items	Stock_Level < Reorder_Level	Products with stock levels below the reorder level
Overstocked Items	Stock_Level > 1.5 * Reorder_Level	Products with stock levels significantly above the reorder level

5. REPORTING AND VISUALIZATION

The following reports and visualizations will be created to communicate the insights effectively:

5.1SALES DASHBOARD

5.1.1 CUSTOMER PURCHASING BEHAVIOR VIEW

- **Visualization**: Bar chart showing total customer involve in buying for current year and comparison with last year.
- **Metrics**: Number of customers buying
- **Filter**: Year, Region, Category, Subcategory

5.1.2 SALES PATTERN BY MONTH VIEW

- **Visualization**: Bar chart showing monthly sales trends comparing from last year.
- **Metrics**: Total Sales Amount, comparison from last year.
- **Filters**: Year, Region, Category, Subcategory

5.1.3 PRODUCT QUANTITY PATTERN BY MONTH VIEW

- **Visualization**: Bar chart showing monthly Quantity trends comparing from last year.
- **Metrics**: Total product sold, comparison from last year.
- **Filters**: Year, Region, Category, Subcategory

5.1.4 PROFIT PATTERN BY MONTH VIEW

- **Visualization**: Bar chart showing monthly profit trends comparing from last year.
- **Metrics**: Total profit, comparison from last year.
- **Filters**: Year, Region, Category, Subcategory

5.1.5 MONTH/QUARTERLY KPI PATTERN BY MONTH VIEW

- **Visualization**: Bar chart showing monthly or Quarterly (option to choose) KPI trends comparing from last year.
- **Metrics**: Customer, Sales, Quantity, Profit.
- **Filters**: Year, Region, Category, Subcategory, KPI, view Type

5.1.6 RANK BY SELECT KPI BY MONTH VIEW

- **Visualization**: Rank chart showing monthly KPI trends comparing from last year.
- **Metrics**: Customer, Sales, Quantity, Profit
- **Filters**: Year, Region, Category, Subcategory, KPI, view Type

5.1.7 CATEGORY PERFORMANCE VIEW

- **Visualization**: Bar chart showing KPI contribution by product category.
- **Metrics**: Customer, Sales, Quantity, Profit.
- **Filters** Year, Region, Category, Subcategory, KPI.

5.1.8 REGION PERFORMANCE VIEW

- **Visualization**: Bar chart showing KPI contribution by Region category.
- **Metrics**: Customer, Sales, Quantity, Profit.
- **Filters** Year, Region, Category, Subcategory, KPI.

5.2 INSIGHT DASHBOARD

5.2.1 DIMENSION WISE AOV VIEW FOR YEAR

- **Visualization**: Bar chart showing “Average order value (AOV)” based on selected dimension.
- **Dimension**: Region, Store, Category, Segment, Subcategory
- **Metrics**: Average order value (AOV)
- **Filter**: Year, Trend by, Region, Category, Subcategory

5.2.2 DIMENSION WISE KPI & GROWTH FOR YEAR

- **Visualization**: Bar chart showing whole year KPI for selected dimension comparison from last year.
- **Metrics**: Revenue, Quantity, Profit, Customer, Growth.
- **Filters**: Year, Region, Category, Subcategory

5.2.3 RANKING BY DIFFERENT KPI MONTHLY/QUARTERLY

- **Visualization**: Rank chart showing ranking by monthly/quarterly for selected KPI.
- **Metrics**: Revenue, Quantity, Profit, Customer, Growth.
- **Filters**: Year, Region, Category, Subcategory, selectable top n dimension.

5.2.4 GROWTH FROM LAST YEAR ON SELECTED DIMENSION VIEW

- **Visualization**: Bar chart showing monthly profit trends comparing from last year.
- **Metrics**: Revenue, Quantity, Profit, Customer, Growth.
- **Filters**: Year, Region, Category, Subcategory

5.3 RECORD DASHBOARD

5.3.1 DIMENSION WISE AOV VIEW FOR YEAR

- **Visualization**: Data table for this dashboard, user can filter the data according to the requirement.
- **Dimension**: All available dimension.
- **Metrics**: All available metrics.
- **Filter**: All the data can be filtered.

6. INSIGHT & RECOMANDATION

6.1 REVENUE & PROFIT PERFORMANCE

Insight:

- The total revenue is £150.5 million, with a profit of £27 million.
- This means a profit margin of around 18% for all categories.
- An 18% profit margin suggests room for improving efficiency and pricing strategies.

Recommendation:

- Identify low-margin products.
- Adjust pricing or discounts as needed.

Benefit:

- Increase profitability while maintaining steady sales.

6.2 PROFIT PER PRODUCT

Insight:

- The average profit for Technology is the lowest at £909.51 compared to other products.
- Heavy discounts might be reducing profitability.

Recommendation:

- Reduce the discount if any.

Benefit:

- Increase profit per sale.

6.3 STOCK OPTIMISATION

Insight:

- Tables and Labels are in high demand with strong sales, indicating strong customer interest.

Recommendation:

- Maintain enough stock levels and optimize pricing.

Benefit:

- Avoid stockouts and ensure continuous revenue flow.

6.4 SHIPMENT COST OPTIMISATION

Insight:

- Standard and Same-day delivery are the most chosen shipment methods, increasing from 2023 to 2024.
- Customers prefer cost-effective delivery first, then same-day delivery.

Recommendation:

- Optimize logistics partnerships to reduce costs.

Benefit:

- Lower shipping expenses, leading to higher profit margins.

6.5 DELIVERY TIME OPTIMISATION

Insight:

- The average delivery time is 6 days. Longer delivery times can lead to customer dissatisfaction.

Recommendation:

- Improve warehouse distribution to shorten delivery times.

Benefit:

- Faster delivery leads to repeat business and positive reviews.

7. CONCLUSION

This BI solution provides a comprehensive framework for analysing sales, customer behaviour, product performance etc. The data model, KPIs, and visualizations are designed to help stakeholders make informed decisions and drive business growth.

8. NEXT STEPS

- **Predictive Analytics:** We can Implement predictive models to forecast future sales, profit, customer churn. Techniques such as regression analysis, time series forecasting, and machine learning algorithms can be employed.
- **Customer Segmentation**: Clustering algorithms can be used to segment customers based on purchasing behaviour. We need to collect more demographics, and other attributes for customers to do segmentation and do more analysis. This can help in targeted marketing and personalized offers.
- **Market Basket Analysis:** Association rule learning to identify products that are frequently bought together. This can aid in cross-selling and upselling strategies.
- **Geospatial Analysis:** We can use maps to visualize sales and customer data by region. This can help in identifying geographic trends and optimizing store locations.
- **Calculate CLV & Modelling:** We need to calculate the CLV and develop a CLV model that incorporates customer segmentation and predictive analytics to identify high-value customers and optimize marketing spend.
- **Demand Forecasting:** Use historical sales data and external factors (e.g., seasonality, promotions) to forecast demand more accurately.