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 |  |

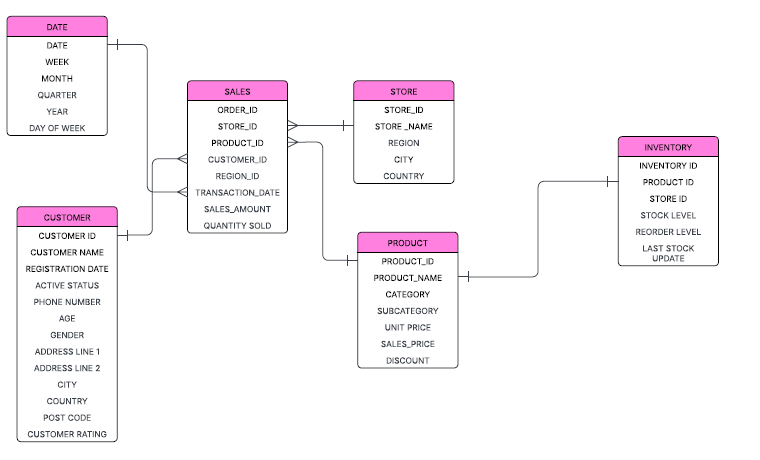
##### DATE (TABLE-5)

| **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.