Project Documentation

Suppliers Quality

### **1. Business Requirements Gathering and Analysis**

1. Identifying the Business [Requirements](https://drive.google.com/file/d/1mysxfUk9vayHGoYMxXTo0o0EdEeOzMU9/view?usp=drive_link)
2. Identify key performance indicators [ (KPIs)for Quality Control: Overall Quality Metrics, Category-Specific Metrics, Material-Related Metrics, Plant-Related Metrics, Vendor-Related Metrics, Time-Series Metrics]
3. Clarifying the project workflow with the team

**2. Data Acquisition and Preparation**

1. - Data Acquisition: done
2. - Profiling: done
3. - Cleaning: done
4. - DataTransformation**:** done
5. - Data Validation: done
6. - Data Testing: done
7. - Reprofiling Data: done

### **3. Data Modeling and Integration**

1. - Validate PK and FK keys
2. - Generated a Calender table with a hierarchy
3. - Reformatted the Diemention plant's table and Completed the attribute with more level of details containing the plant’s location (country, state, city)
4. - modeling the schema
5. - valid the data integrity

### **4. Data Analysis and EDA**

**Potential Hypotheses and Assumptions:**

Based on the structure of the data, here are some hypotheses and assumptions about the potential EDA and correlations:

1. **Root Cause Analysis:**
   * **Hypothesis:** Specific combinations of category, defect type, material type, plant, or vendor may frequently contribute to defects.
   * **Assumption:** Analyzing the distribution of defects across these dimensions will help identify common patterns and potential root causes.
2. **Material Quality Impact:**
   * **Hypothesis:** Certain material types may be more prone to defects than others.
   * **Assumption:** Comparing the defect rates for different material types will provide insights into material quality and its influence on defects.
3. **Plant Performance:**
   * **Hypothesis:** Some plants may have higher defect rates than others, indicating potential issues with manufacturing processes or equipment.
   * **Assumption:** Analyzing defect rates by the plant will help identify areas for improvement in manufacturing practices.
4. **Vendor Quality:**
   * **Hypothesis:** Certain vendors may supply materials that are more likely to be defective.
   * **Assumption:** Comparing defect rates by vendor will help assess the quality of materials from different suppliers.
5. **Correlation Analysis:**
   * **Hypothesis:** There may be correlations between different dimensions, such as defect type and material type, or between plant and defect rate.
   * **Assumption:** Using correlation analysis techniques will help identify relationships between variables and provide insights into the underlying factors contributing to defects.

**5. Visualisation**

1. - **geographical map** with pie charts to analyze defect data.
2. - **Time Series Analysis**
3. - **scatter blot** that analyzes the relationship between defect quantity and downtime hours for different defect categories
4. - **combination chart** that analyzes defect and downtime data for different plants
5. - **table calculation** that shows percentages of Defect Items per categories

### **6. Business Report and Recommendations**

1. **Summary of Findings**:
   1. Key metrics were identified and tracked, showing clear trends in material quality, plant performance, and vendor quality.
   2. Root cause analysis highlighted that certain vendors and plants are consistently associated with higher defect rates, particularly in specific product categories.
   3. Material type analysis revealed that some materials are more defect-prone, with certain suppliers contributing to the majority of these defects.
2. **Actionable Insights**:
   1. **Vendor Improvements**: Negotiate with vendors who supply high-defect materials and explore alternative suppliers for key materials.
   2. **Plant Process Optimizations**: Implement process improvements in the plants identified with the highest defect rates. Consider retraining staff or investing in better equipment.
   3. **Material Substitution**: Investigate the possibility of substituting high-defect materials with alternatives that have shown better quality performance.
   4. **Correlated Defects**: Focus on the specific combinations of defects, materials, and plants that are highly correlated to further investigate root causes and mitigate them effectively.
3. **Future Recommendations**:
   1. Implement continuous quality monitoring dashboards to track supplier and plant performance in real-time.
   2. Establish stronger quality control processes in plants and more rigorous material inspections from suppliers to prevent future defects.