Work Document

Project Objective:

The objective of this mini project is to perform a comprehensive data analysis on product defects to support Quality Control (QC) processes. Using a structured dataset containing fields such as Defect ID, Product ID, Defect Type, Defect Date, Defect Location, Severity, Inspection Method, and Repair Cost, this analysis aims to:

- Identify the most common types of defects and their locations.
- Evaluate trends in defects over time.
- Assess the severity levels associated with different defects.
- Compare the effectiveness of inspection methods.
- Analyse the impact of defects on repair costs.
- Provide actionable insights to minimize defect occurrence and improve overall product quality.

Title: **Quality Control & Defect Analysis**

Data Collection:

The dataset used in this project was collected as part of a quality control process in a manufacturing environment. It consists of 1,000 rows of defect-related records stored in a CSV (Comma-Separated Values) format. Each row represents a unique defect identified during the inspection of various products. The dataset includes the following key attributes:

- **Defect-id:** Unique identifier for each defect**.**
- **Product-id:** Identifier of the product with the defect.
- **Defect-type:** Nature or category of the defect (e.g., Cosmetic, Structural, Functional).
- **Defect-date:** The date when the defect was identified.
- **Defect-location:** Specific location on the product where the defect was found.
- **Severity:** Level of seriousness of the defect (e.g., Minor, Moderate, Critical).
- **Inspection-method:** Method used to detect the defect (e.g., Visual, Automated, Manual).
- **Repair-cost:** Estimated or actual cost incurred to repair the defect.

Data Cleaning:

- Defect dataset contained inconsistency of data, So corrected the data by using PROPER () function.
- The dataset contained duplicate values, so within the power query used “remove duplicates” feature to clear the duplicates.

- The dataset contains the Defect-date column format as “06-06-2024 & 4/26/2024 “by using date format changed to DD/MM/YYYY format.
- The columns were containing white spaces by used trim function xl sheet to clear the white spaces.
- Observed some missing values in some columns, so if the column was number column replaced missing values with AVERAGE () function, if it was text column replaced with MODE ().
- Performed date formatting and transformation in Excel by extracting the month from the 'Defect Date' column using built-in functions such as TEXT () and MONTH (). This allowed for monthly trend analysis in dashboard.

Analysis Questions:

1. What are the most frequent defect types?
2. How do defect types and severity levels vary month-wise?
3. What is the average repair cost overall?
4. What does the severity-wise defect analysis reveal?
5. How are defects distributed by location?
6. What is the total number of defects reported?
7. What is the average repair cost across all defects?
8. Which defect types have the highest severity counts?
9. How are defects distributed by inspection method?
10. What is the average repair cost by defect type?
11. Which defect type has the highest repair cost?
12. What is the location-wise distribution of defect types?
13. Which product IDs are associated with different defect types?

Power BI

- Loaded the data into Power BI transformed the data in power query by making first row as header.
- Changed the datatypes according to the column.
- Used Measures and Calculated columns as per requirement for example using Total defects, highest severity count, Total products, Average repair cost and more.
- For calculated columns made use of DAX.

Measures:

1.**Total Products**=DISTINCTCOUNT (defects_data1[Product-id])

2.**Total Defects**=SUM (defects_data1[Defect-id])

3.**Highest Severity Count**=MAXX (SUMMARIZE (defects_data1, 'defects_data1'[Severity],

"Severity Count", COUNTROWS('defects_data1')), [Severity Count])

4.**Average Repair Cost**= AVERAGE (defects_data1[Repair-cost])

5.**Count of defects**=DISTINCTCOUNT (defects_data1[Defect-id])

Interactive Filtering with Slicers:
Implemented slicers in the Power BI dashboard to allow users to interactively filter defect data based on:

- **Defect Location**: View and compare defects by specific locations.
- **Severity**: Analyse trends based on severity levels (e.g., Critical, Minor, Moderate).
- **Inspection Method**: Drill down into data based on the method used for inspection (e.g., Automated Testing, Manual Testing, Visual Inspection).

Visualizations Implemented:

1. **Highest Severity Count by Defect Type**
    - Identified which defect types are associated with the highest severity levels to prioritize quality control efforts.
2. **Sum of Product ID by Defect Type**
    - Measured the volume of defective products by category to assess the impact of specific defect types.
3. **Highest Severity Count by Defect Location**
    - Analysed locations contributing the most severe defects to assist in root cause analysis and preventive action planning.
4. **Highest Severity Count by Defect Month and Severity**
    - Monitored monthly trends of severe defects to identify critical periods requiring operational attention.
5. **Sum of Defect ID by Inspection Method**
    - Compared the number of defects detected using different inspection methods to evaluate their effectiveness.
6. **Sum of Repair Cost by Defect Type**
    - Evaluated the cost impact of various defect types to support cost-reduction strategies.
7. **Sum of Defect ID by Defect Month and Defect Type**
    - Analysed defect trends over time categorized by type, helping to detect seasonal or recurring quality issues.
8. **Count of Defect Type by Defect Location**
    - Compared the frequency of defect types across locations to localize quality challenges.

Dashboard:


Quality Control & Defect Analysis Dashboard
358
Highest Severity Co...
Highest Severity Count by Defect_type
Structural
Functional
Cosmetic
Defect_type
0
100
Highest Severity Count
Inspection_method Sum of Repair_cost Highest Severity Count
Automated Testing 1,49,035.88 104
Manual Testing 1,85,178.29 135
Visual Inspection 1,73,412.98 122
Total 5,07,627.15 358
Sum of Product_id by Defect_type
Functional
Structural
Cosmetic
Defect_type
0K
10K
20K
Sum of Product_id
Highest Severity Count by Defect_location
115 (32.03%)
128 (35.65%)
116 (32.31%)
Defect_locati...
Surface
Compone...
Internal
Highest Severity Count by Defect Month and Severity
Severity Critical Minor Moderate
200
100
0
Highest Sever...
Janu...
March
May
Febr...
June
April
Augu...
Nove...
Defect Month
Sum of Defect_id by Inspection_method
152K (30.31%)
178K (35.61%)
171K (34.08%)
Inspection_...
Visual Ins...
Manual T...
Automat...
Sum of Repair_cost by Defect_type
158.8K (31.28%)
176.92K (34.85%)
171.91K (33.86%)
Defect_type
Structural
Functional
Cosmetic
501K
Total Defects
100
Total products
507.63
Average Repaire Cost
Sum of Defect_id by Defect Month and Defect_type
Defect_type Cosmetic Functional Structural
40K
20K
0K
Sum of Defect_id
March
January
February
May
June
April
Novem...
August
Defect Month
Count of Defect_type by Defect_location
400
300
200
100
0
Count of Defect_type
Surface
Component
Internal
Defect_location
Defect_location
All
Severity
All
Inspection_method
All