

1. Project Design

- **Project Objective:** Analyze manufacturing downtime data to identify key downtime causes and propose data-driven solutions to minimize operational delays.
- **Scope:** Focus on analyzing downtime duration, frequency, and causes over a specific period.
- **Tools Used:** Python for data cleaning, Excel for data analysis, Power BI for visualization.

2. Wireframe

- The dashboard will include the following sections:
 - Overview of total downtime duration and frequency.
 - Breakdown of downtime by machine, department, and shift.
 - Analysis of top downtime causes.
 - Comparison of downtime trends over different periods.
 - KPIs for monitoring ongoing performance.

3. Model

- Data was cleaned using Python to handle missing values, outliers, and data normalization.
- Data analysis was performed using Excel to calculate key metrics such as mean downtime.
- Key DAX formulas applied in Power BI:
 - Total Downtime = SUM(Downtime[Duration])
 - Average Downtime per Shift = AVERAGE(Downtime[Duration])
 - Top 10 Downtime Events =
 - TOPN(
 - 10,
 - ADDCOLUMNS(
 - SUMMARIZE(
 - 'line downtime',
 - 'line downtime'[Date],
 - 'line downtime'[Start Time],
 - 'line downtime'[End Time],
 - 'line downtime'[Batch],
 - 'line downtime'[Product],
 - 'line downtime'[Operator],
 - 'line downtime'[Factor]
 -),
 - "DurationSeconds", DATEDIFF([Start Time], [End Time], SECOND),
 - "OperatorError", LOOKUPVALUE('downtime factors'[Operator Error],
 - 'downtime factors'[Factor], [Factor])
 -),
 - [DurationSeconds],
 - DESC)
 -

4. Visualizations

- Power BI dashboard includes:
 - Bar charts showing downtime by machine.
 - Line graphs showing downtime trends over time.
 - Pie charts illustrating percentage contribution of each downtime cause.
 - KPI cards for total downtime, average downtime, and most frequent cause.

5. Tutorials

- How to use the dashboard:
 - Navigate through the main dashboard to view overall downtime trends.
 - Apply filters by machine, department, and shift to isolate specific data.
 - Use slicers to compare different time periods and operator

6. Report

- Key Findings:
 - The top three downtime causes are machine failure, maintenance, and operator error.
 - The department with the highest downtime is the assembly line.
 - The average downtime per shift is 1.5 hours.
- Recommendations:
 - Implement preventive maintenance schedules for frequently failing machines.
 - Conduct training for operators to reduce human error.
 - Monitor downtime patterns weekly to track progress.