

Interactive Excel Dashboard for Road Accident Analysis

Introduction

The objective of this project was to develop an interactive Excel dashboard to analyze road accident data comprehensively. The dashboard is designed to provide dynamic, filterable key performance indicators (KPIs) that offer insightful views into various aspects of road accidents, such as severity, location, and vehicle types involved. By handling a substantial dataset containing over 307,000 rows, the project showcases the capabilities of Excel in managing and visualizing large amounts of data effectively.



Data Preparation and Cleaning

The initial phase involved meticulous data cleaning and preparation to ensure the accuracy and reliability of the analysis. The dataset contained missing values and typographical errors that could potentially skew the results. The following steps were undertaken:

- **Handling Missing Values:** Identified and filled or removed missing data points to maintain data integrity.
- **Correcting Typographical Errors:** Reviewed and corrected inconsistencies in data entries, such as misspelled categories or incorrect date formats.
- **Data Standardization:** Ensured uniformity in data representation, particularly in categorical fields like accident severity and vehicle types.

This thorough cleaning process was crucial in setting a solid foundation for accurate data analysis and visualization.

Data Processing with Advanced Formulas

To enhance the dataset's analytical flexibility, calculated columns were added using advanced Excel formulas:

- **Extracting Month and Year:** Utilized the TEXT function to derive month and year from the date column.
 - **Month:** =TEXT([Date Cell], "mmm") provided the three-letter month abbreviation.
 - **Year:** =TEXT([Date Cell], "yyyy") extracted the four-digit year.
- **Creating Calculated Fields:** Developed calculated items within pivot tables to aggregate data meaningfully, such as grouping similar vehicle types under broader categories.

These calculated fields allowed for more nuanced analysis, enabling trends and patterns to be identified over specific time frames.

Dashboard Creation and Custom Visuals

The dashboard was built using a combination of pivot tables, charts, and custom visuals to meet specific KPI requirements:

- **Pivot Tables and Charts:** Established pivot tables to summarize data efficiently and created pivot charts for visual representation.
- **Dynamic Slicers:** Integrated slicers for fields like "Urban/Rural" location, enabling users to filter data interactively.
- **Custom Icons and Visuals:**
 - **Icons:** Incorporated relevant icons (e.g., cars, motorcycles) using Excel's "Insert > Icons" feature to make the dashboard more intuitive.
 - **Shapes and Formatting:** Used customized shapes with consistent colors and rounded corners to enhance visual appeal and maintain a professional look.
 - **Donut Charts:** Implemented donut charts with dynamic data labels to represent key statistics such as accident severity and locations.

By focusing on user experience, the dashboard became not only informative but also engaging and easy to navigate.

Dynamic Filtering Capabilities

A significant feature of the dashboard is its ability to filter accidents by urban versus rural locations:

- **Slicer Setup:** Created slicers linked to the "Urban/Rural" field, allowing users to filter the entire dashboard based on location type.
- **Linked Pivot Tables:** Ensured that selecting an option in the slicer updates all connected pivot tables and charts automatically.
- **Responsive KPIs:** The KPIs at the top of the dashboard adjust in real-time with each slicer selection, providing immediate insights specific to the chosen location.

This dynamic filtering empowers users to perform focused analyses, essential for decision-making processes that depend on geographical distinctions.

Insights and Findings

The dashboard revealed several critical insights based on the analyzed data:

Accident Severity

- **Fatal vs. Non-Fatal Accidents:**
 - **Fatal Casualties:** There are **7,135** fatal casualties, representing **1.7%** of the total **417,883** casualties.
 - **Serious Casualties:** **59,312** casualties are classified as serious, making up **14.2%** of the total.
 - **Slight Casualties:** The majority, **351,436** casualties, are slight, representing **84.1%** of all incidents.
 - **Insight:** While most accidents are non-fatal, the presence of over 7,000 fatal incidents indicates an area of critical concern for public safety.

Location-Based Trends

- **Urban vs. Rural Accidents:**
 - **Urban Areas:** **61%** of accidents (approximately **255,000 casualties**) occurred in urban areas.
 - **Rural Areas:** **39%** of accidents (around **162,000 casualties**) occurred in rural areas.
 - **Insight:** Urban areas experience more accidents, likely due to higher traffic density, suggesting the need for urban-specific safety measures.

Vehicle Types Involved

- **Cars:** Involved in **333,485** casualties, making them the predominant vehicle type in accidents, accounting for about **80%** of all casualties involving vehicles.
- **Other Vehicles:**
 - **Motorcycles:** Involved in **3,367** casualties.
 - **Buses:** Account for **1,279** casualties.
 - **Trucks:** Involved in **3,347** casualties.
- **Insight:** Cars represent the majority of vehicles involved in accidents, suggesting a need to focus safety campaigns on car drivers and infrastructure that caters to cars.

Road Type

- **Single Carriageway:** The most common road type for accidents, associated with **309,700** casualties.
- **Dual Carriageway:** Recorded **67,400** casualties.

- **Roundabouts:** Involved **26,800** casualties.
- **Insight:** Single carriageways are the primary road type where accidents occur, indicating potential areas for traffic management improvements or additional safety features.

Road Surface Conditions

- **Dry Surface:** A significant majority of accidents occurred on dry surfaces.
- **Wet Surface:** Also contributed notably, indicating that adverse weather does increase accident risk.
- **Snow/Ice:** Represents a smaller portion of accidents.
- **Insight:** Road safety initiatives should take into account the higher incidence of accidents on dry surfaces, possibly due to complacency or higher speeds in ideal conditions.

Light Conditions

- **Daylight:** **73%** of accidents occurred in daylight, with over **300,000** casualties.
- **Dark:** **27%** of accidents took place at night or in low-light conditions, involving approximately **113,000** casualties.
- **Insight:** Despite better visibility, accidents are more common in daylight, possibly due to higher traffic volumes, though night-time accidents still pose significant risks.

Monthly and Yearly Trends

- **Monthly Trends:** Peaks are observed towards the end of the year, especially in **November** and **December**. This could be due to increased holiday traffic and adverse weather conditions.
- **Yearly Comparison:** Casualty trends remained consistent across years with a slight increase in 2022, indicating a gradual rise in accident rates.
- **Insight:** Seasonal patterns highlight the need for heightened road safety measures during high-traffic periods, especially in the holiday season.

These quantitative insights are instrumental in guiding policy decisions, resource allocation, and developing targeted safety measures based on specific trends in accident severity, location, vehicle type, and seasonal fluctuations.

Technical Skills Highlighted

The project showcases a range of technical skills in Excel:

- **Data Management:**
 - **Handling Large Datasets:** Efficiently managed and analyzed over 307,000 rows of data.
 - **Data Cleaning:** Applied techniques to clean and prepare data, ensuring accuracy.
- **Advanced Excel Functions:**
 - **Formulas:** Utilized functions like TEXT, VLOOKUP, and calculated fields for data manipulation.

- **Pivot Tables and Charts:** Created complex pivot tables and charts for summarizing data.
- **Interactive Dashboard Development:**
 - **Slicers and Dynamic Filtering:** Implemented slicers to enable interactive data exploration.
 - **Responsive KPIs:** Developed KPIs that update in real-time with data filters.
- **Visual Design and Usability:**
 - **Custom Icons and Shapes:** Enhanced the dashboard's aesthetic appeal and user-friendliness.
 - **Consistent Formatting:** Applied cohesive color schemes and styles for a professional look.
- **Analytical Skills:**
 - **Data Analysis:** Extracted meaningful insights from data trends and patterns.
 - **Problem-Solving:** Addressed data challenges through innovative Excel solutions.

These skills demonstrate proficiency in Excel as a powerful tool for data analysis and visualization, highlighting the ability to deliver complex projects effectively.

Conclusion

The completion of the interactive Excel dashboard for road accident analysis underscores the potential of Excel in handling large datasets and creating user-friendly analytical tools. The dashboard not only provides valuable insights into accident trends and patterns but also serves as a foundation for informed decision-making. By combining technical expertise with thoughtful design, the project delivers a comprehensive solution that meets the client's needs for accessible and actionable data insights.