Introduction

This project involved the development of two interactive dashboards using Tableau and Power BI, based on a traffic violations dataset. The aim was to explore the capabilities of each tool in presenting meaningful insights through effective visualizations for a **traffic control agency**. By comparing the usability, flexibility, and visual output of both tools, this report critically evaluates their strengths and limitations in handling complex, multi-dimensional data.

Process Overview

The dataset selected for this project contains detailed information about traffic violations, including violation types, time of day, vehicle and driver details, and location. It includes over 20 columns, making it suitable for multidimensional analysis.

In Tableau, the dashboard was designed using five visuals: a scatter plot for violation severity, a heatmap showing demographic breakdown by race and gender, a map of enforcement efficiency by state, an area chart of safety incidents over time, and a dynamic filter using a severity threshold parameter. Tableau's drag-and-drop interface made it intuitive to build charts, and parameters were easy to set up using calculated fields.

In Power BI, the same five visuals were recreated, but the process was more formula-driven. DAX (Data Analysis Expressions) was used to calculate measures like enforcement efficiency and conditional filters. While slicers were straightforward to implement, creating parameter-like functionality required extra steps, including building separate tables and establishing relationships.

One of the most challenging parts was replicating the enforcement efficiency logic from Tableau to Power BI, as Tableau automatically aggregates values by dimension (e.g., state), whereas Power BI required the explicit creation of summarized tables or carefully scoped DAX measures.

Process of Visualization

The dataset selected for this project contains detailed records of traffic violations, including attributes such as violation type, location (state), race, gender, date and time, and outcome (e.g., citation or warning). With over 20 columns, it provided a rich basis for developing complex and interactive dashboards.

In **Tableau**, I was able to build the dashboard relatively quickly using its intuitive drag-and-drop interface. Creating calculated fields like the *Risk Factor* (based on severity score) and implementing the *Severity Threshold* parameter for filtering visuals was simple and visual. The enforcement efficiency map, demographic heatmap, and time-based area chart came together smoothly. Tableau's ability to automatically aggregate data at different dimensions (like state) without explicitly defining grouping logic made the development process easier. The biggest advantage was the flexibility in exploring the dataset visually before finalizing calculations.

In **Power BI**, the process was more technical. Reproducing the same visuals required writing DAX measures for calculated fields, especially for conditional calculations such as *Enforcement Efficiency*. Implementing the severity threshold functionality was significantly more complex: I had to create a separate parameter table, link it using relationships, and then build filtered measures

using SELECTEDVALUE() and CALCULATE() functions. Unlike Tableau, Power BI does not automatically group data by dimension, which meant I had to create summarized tables using functions like SUMMARIZE() and ADDCOLUMNS() to mimic Tableau's AGG behavior. Additionally, the map visual required careful configuration to correctly recognize states, which Tableau handled automatically.

Overall, while Tableau felt more fluid and visual in its approach, Power BI demanded a deeper understanding of data modeling and DAX logic. However, both tools ultimately produced dashboards that successfully highlighted patterns in traffic violations and supported dynamic user interaction.

Tableau vs Power BI

Criteria	TABLEAU	POWER BI
EASE of USE	Drag and drop	DAX
Easy to Calculate	Easy to create calculated field	DAX
Filtre/Parameter	Filtering by Flexible Parameters	Created extra table to use features
Mapping Support	Automatically recognizes locations	Data Category setting is required to recognize states
Grouping Data(agg)	Automatically calculates based on groups with AGG()	Manual grouping should be done
Style	Charts are visually more flexible	More corporate, simple appearance

This project significantly deepened my understanding of data visualization, data modeling, and tool-specific workflows. Through working with both Tableau and Power BI, I developed the ability to translate analytical logic into calculated fields and measures, and to build interactive dashboards that communicate insights effectively.

I learned how to apply conditional logic in Tableau using calculated fields and parameters, and how to visually filter data with minimal setup. In Power BI, I gained hands-on experience with DAX expressions, filter context, and functions. I also learned how to manage relationships between tables, and how slicers, cards, and maps interact with data.

A key learning was the importance of thinking from the user's perspective. I realized that while Tableau allows for faster prototyping, Power BI requires a more structured approach but offers greater control once mastered.

Conclusion

Working with both Tableau and Power BI highlighted the strengths and limitations of each platform in a real-world data visualization context. Tableau proved to be ideal for quick, intuitive exploration and visual storytelling. Its interface made it easy to test different visual ideas rapidly, and its built-in handling of aggregation and mapping was especially efficient.

Power BI, in contrast, offered a deeper level of control over calculations, filtering logic, and data modeling. Although the learning curve was steeper due to the need for DAX, the tool ultimately allowed for more robust and flexible dashboards once the structure was in place.

If the goal is to build interactive dashboards quickly with minimal coding, Tableau is the more accessible option. However, for enterprise-level dashboards with more complex logic and integration needs, Power BI stands out as the more scalable solution.