Root Cause Analysis of Website Traffic Performance

1. Introduction

In the digital era, website traffic analysis plays a crucial role in understanding user behaviour and optimizing business performance. A sudden decline or underperformance in website traffic can directly impact engagement, conversions, and overall revenue. Therefore, identifying the underlying reasons behind traffic issues is essential for informed decision-making.

This project focuses on performing a Root Cause Analysis (RCA) of website traffic performance using Excel for data cleaning and analysis, and Tableau for visualization and storytelling. The objective is to identify key factors affecting user engagement and conversion and provide actionable business insights.

2. Objectives of the Project

The primary objectives of this project are:

- To clean and prepare raw website traffic data for analysis
- To analyse user engagement, bounce behaviour, and conversion patterns
- To identify traffic sources contributing to performance issues
- To understand differences between new and returning users
- To visualize insights using an interactive Tableau dashboard
- To derive actionable recommendations based on analytical findings

3. Tools and Technologies Used

Tool	Purpose
Microsoft Excel	Data cleaning, transformation, and pivot analysis
Tableau Desktop	Data visualization and dashboard creation

4. Dataset Description

4.1 Dataset Overview

The dataset represents simulated website analytics data generated for educational purposes. It contains 2000 records and 7 primary attributes, capturing user interaction and engagement metrics.

4.2 Attributes Description

Attribute	Description
Page Views	Number of pages viewed during a session
Session Duration	Total session duration in minutes
Bounce Rate	Percentage of users who left after viewing one page
Traffic Source	Origin of traffic (Organic, Social, Paid, Direct, Referral)
Time on Page	Time spent on a specific page
Previous Visits	Number of past visits by the user
Conversion Rate	Indicates whether a conversion occurred (0 or 1)

5. Data Preprocessing and Feature Engineering

Before analysis, the dataset was cleaned and standardized to ensure accuracy and consistency.

5.1 Data Cleaning Steps

- Removed duplicate records
- Handled formatting inconsistencies (numeric and percentage fields)
- Standardized categorical values (e.g., traffic sources)
- Verified logical data ranges to detect anomalies

5.2 Derived Features

To enhance analytical depth, additional features were created:

- **User Type:**
  - New User (Previous Visits = 0)
  - Returning User (Previous Visits > 0)
- **Engagement Level (based on Page Views):**
  - High (≥ 4 pages)
  - Medium (2–3 pages)
  - Low (1 page)

These derived attributes enabled meaningful segmentation and behavioural analysis.

6. Exploratory Data Analysis Using Excel

Excel pivot tables were used to perform drill-down analysis and identify potential root causes.

6.1 Engagement Distribution Analysis

This analysis evaluated how traffic is distributed across different engagement levels.

Insight:
Most page views originate from high-engagement sessions, indicating that users who stay on the website tend to interact deeply.

Row Labels	Sum of Page Views
High	8649
Low	69
Medium	1183
Grand Total	**9901**

Engagement Level vs Page Views Pivot Table

6.2 Traffic Source vs Engagement Analysis

Traffic sources were compared across engagement levels to assess quality differences.

Insight:
While organic traffic contributes the highest volume, social traffic shows a relatively higher proportion of medium and low engagement sessions.

Sum of Page Views	Column Labels			
Row Labels	High	Low	Medium	Grand Total
Direct	950	9	113	1072
Organic	3486	32	432	3950
Paid	1858	11	247	2116
Referral	1272	7	221	1500
Social	1083	10	170	1263
Grand Total	**8649**	**69**	**1183**	**9901**

Traffic Source vs Engagement Pivot Table

6.3 Bounce Rate by Traffic Source

Bounce rate analysis was performed to identify sources with higher exit behaviour.

Insight:
Social traffic exhibits the highest average bounce rate, suggesting lower landing page relevance or weaker user intent.

Row Labels	Average of Bounce Rate
Direct	28.46%
Organic	28.18%
Paid	29.60%
Referral	26.63%
Social	29.63%
Grand Total	**28.48%**

Average Bounce Rate by Traffic Source Pivot Table

6.4 User Type vs Conversion Analysis

This analysis compared conversion performance between new and returning users.

Insight:
Returning users convert at a higher rate than new users, indicating stronger retention but weaker first-time user conversion.

Row Labels	Average of Conversion Rate
New	0.967540014
Returning	0.984449533
Grand Total	**0.982065291**

Conversion Rate by User Type Pivot Table

6.5 Engagement vs Conversion Analysis

The relationship between engagement and business outcomes was evaluated.

Insight:
Higher engagement levels strongly correlate with higher conversion rates, confirming engagement as a key business driver.

Row Labels	Average of Conversion Rate
High	0.985146574
Low	0.962751907
Medium	0.975603761
Grand Total	**0.982065291**

Engagement Level vs Conversion Rate Pivot Table

7. Tableau Dashboard Visualization

To effectively communicate insights, an interactive Tableau dashboard was created.

7.1 Dashboard Components

The dashboard includes:

- Engagement Distribution
- Engagement Impact on Conversion
- Traffic Source Distribution
- Bounce Rate by Traffic Source
- Conversion by User Type

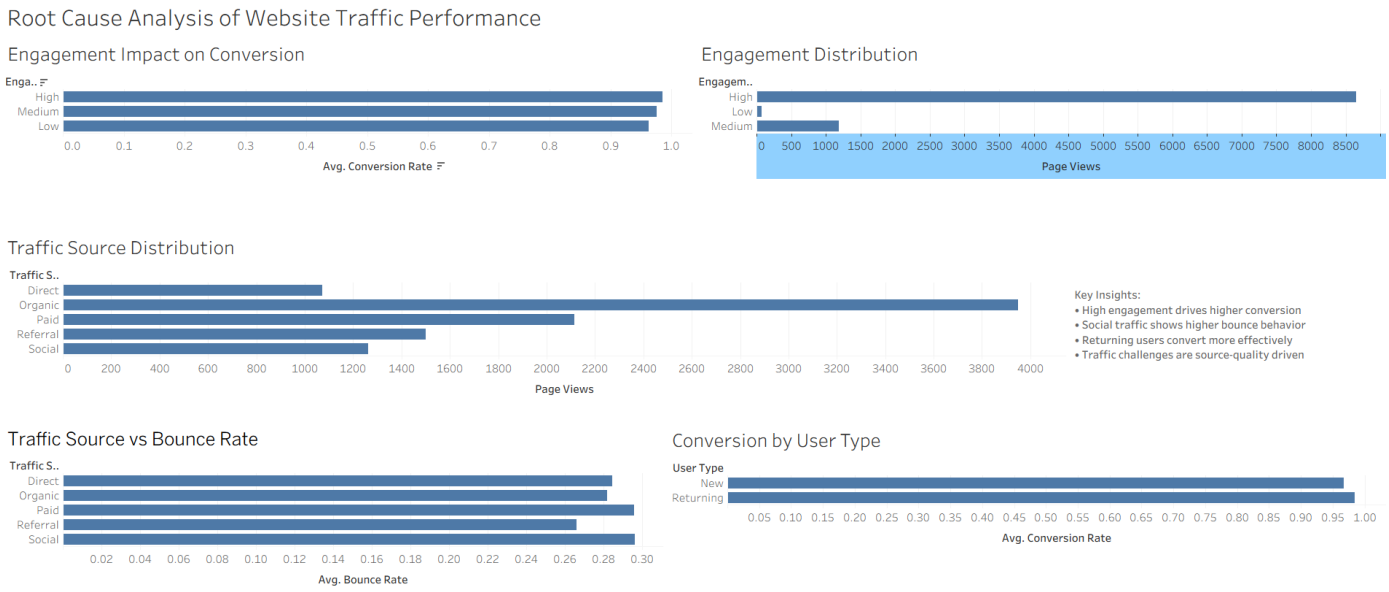

Tableau Dashboard Overview

7.2 Dashboard Purpose

The dashboard enables stakeholders to:

- Quickly identify performance bottlenecks
- Compare traffic sources visually
- Understand how engagement impacts conversion
- Interactively filter insights for deeper exploration

8. Root Cause Analysis Summary

Based on Excel analysis and Tableau visualizations, the following root causes were identified:

- Traffic performance issues are not due to overall engagement weakness
- Source-level quality variation, particularly from social traffic, affects bounce behavior
- New users convert less effectively, indicating onboarding or landing page issues
- High engagement is strongly linked to higher conversion, making it a critical optimization focus

9. Business Recommendations

Based on the findings, the following recommendations are proposed:

1. Improve landing page relevance for social traffic
2. Optimize onboarding experience for first-time users
3. Focus on strategies that increase user engagement (content depth, navigation clarity)
4. Retain high-performing organic and referral traffic through SEO and partnerships

10. Conclusion

This project successfully demonstrates an end-to-end Root Cause Analysis of Website Traffic Performance using Excel and Tableau. By combining data cleaning, exploratory analysis, and visualization, meaningful insights were derived to explain performance challenges and guide data-driven decision-making.

The project highlights the importance of engagement quality and traffic source effectiveness in driving conversions and overall website success.

11. Acknowledgment

The dataset used in this project was generated for educational purposes. This project was completed as part of a Business Analyst hiring assessment to demonstrate analytical, problem-solving, and data visualization skills.