Consumer Behaviour Analysis Using Simulated E-commerce Data

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Executive Summary
This report presents an applied consumer behaviour analysis based on a simulated GA4-style e-commerce dataset. The study examines conversion performance, purchase funnel dynamics, and revenue generation across traffic sources and devices. The findings provide actionable insights to support data-driven marketing decision-making.

Introduction
Understanding how consumers interact with digital channels is essential for an effective marketing strategy. This project analyzes user behaviour across multiple traffic sources and devices, focusing on conversion efficiency, funnel progression, and revenue contribution.

Data and Methodology
The analysis is based on a GA4-style session- and event-level dataset representing e-commerce user interactions. Data processing and analysis were conducted using Python, with pandas for data manipulation and matplotlib for visualization. Key performance indicators include conversion rate, funnel step conversion, and revenue per session.

Analysis and Results
Conversion rate analysis by traffic source shows that Paid and Social channels outperform Organic and Direct sources, indicating higher user intent and campaign effectiveness.

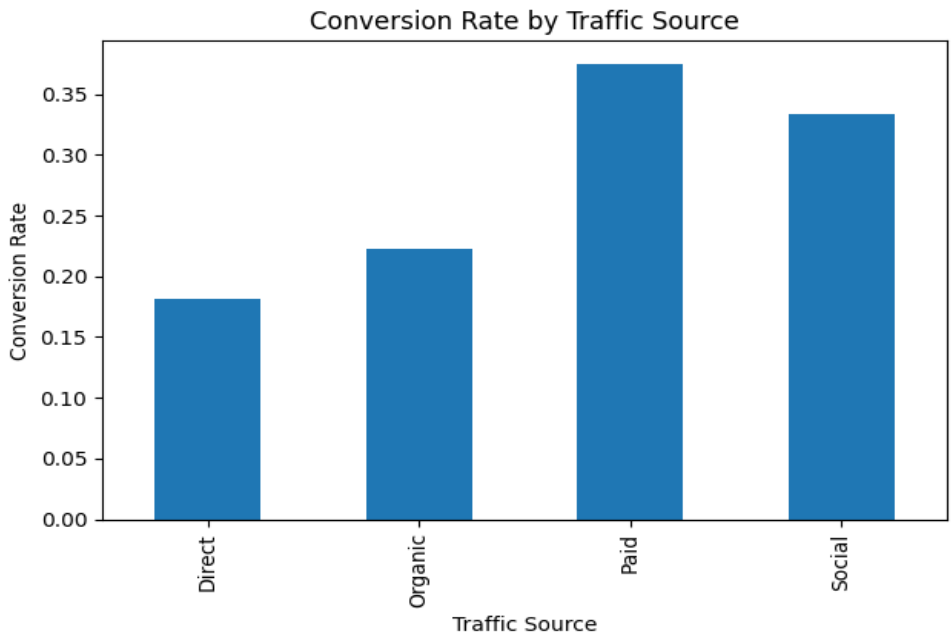

Figure 1. Conversion Rate by Traffic Source

Device-level analysis indicates comparable conversion rates across desktop and mobile users, suggesting consistent user experience and purchase behaviour across devices.

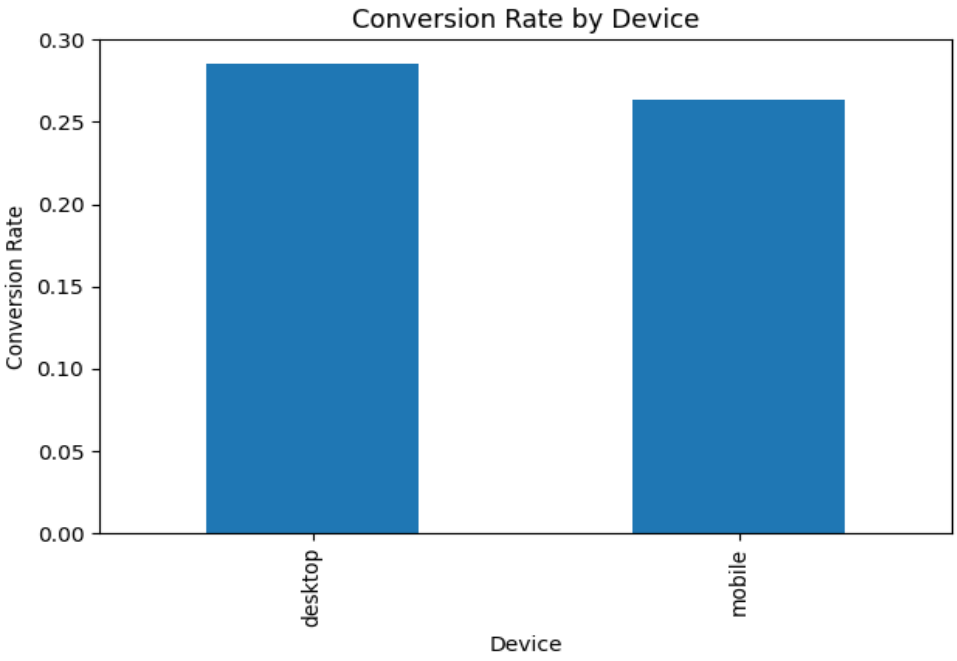

Figure 2. Conversion Rate by Device

Funnel Analysis

Funnel analysis reveals a gradual and consistent drop-off across stages of the purchase journey. Approximately two-thirds of users progress from product view to add-to-cart, with subsequent stages maintaining relatively strong conversion rates. This pattern reflects a healthy purchase funnel with no critical bottlenecks.

Revenue Analysis

Revenue analysis demonstrates that Social and Paid traffic sources generate the highest revenue per session, highlighting their strategic importance despite differences in overall traffic volume.

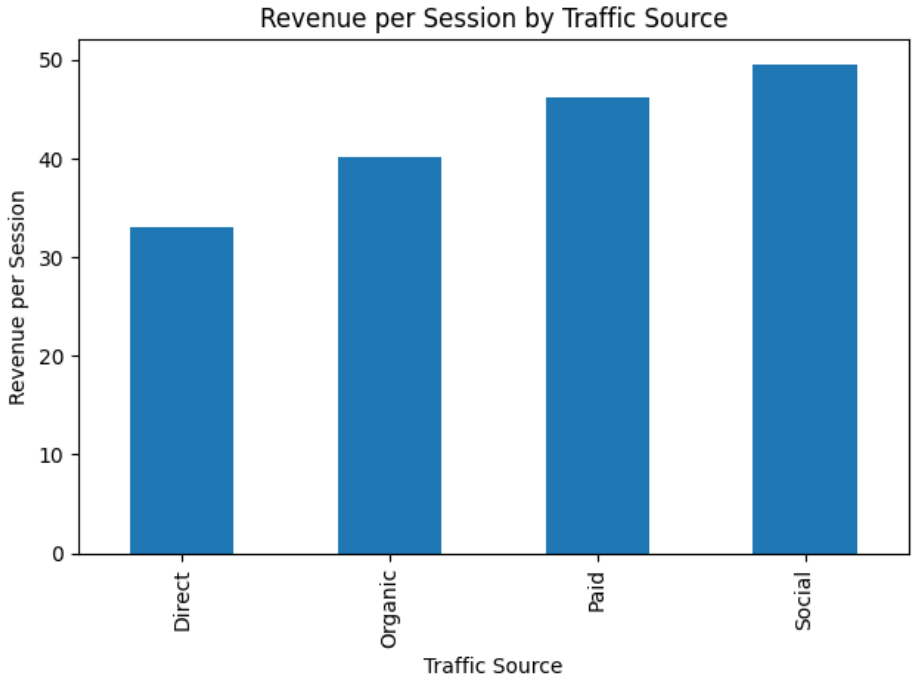

Figure 3. Revenue per Session by Traffic Source

Device-based revenue analysis shows slightly higher revenue per session for desktop users compared to mobile users, indicating a trade-off between conversion frequency and transaction value.

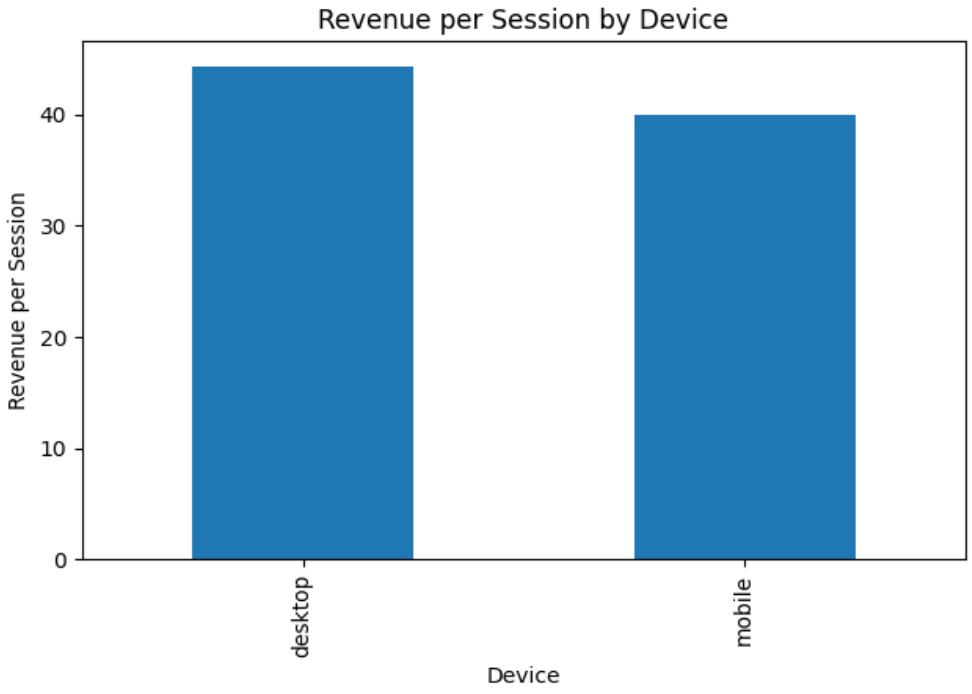

Figure 4. Revenue per Session by Device

Managerial Implications

Marketing resources should prioritize Paid and Social channels due to their superior conversion and revenue performance. Additionally, maintaining consistent optimization across both desktop and mobile platforms is essential to maximizing overall revenue potential.

Limitations and Future Work

This study is based on a simulated GA4-style dataset and therefore reflects sample-specific patterns rather than universal behavioural rules. Future research could extend this analysis using larger real-world datasets, customer-level segmentation, and predictive modelling to enhance strategic decision-making.

Conclusion

This project demonstrates how structured digital analytics can be used to analyze consumer behaviour and inform marketing strategy. By integrating conversion, funnel, and revenue analyses, the study provides a comprehensive view of performance across channels and devices.