

E-commerce Conversion Rate Analysis Report

Google Analytics 4 Performance Analysis

Business Problem

This analysis examines Google Analytics 4 e-commerce data to understand current conversion performance and identify optimization opportunities. With a baseline conversion rate of 1.88% compared to a target of 2.5%, there is a 0.62 percentage point gap that requires investigation across traffic sources, user behavior patterns, and conversion funnels.

Dataset Overview

Data Source: Google BigQuery public dataset (bigquery-public-data.ga4_obfuscated_sample_ecommerce)

Time Period: November - December 2020

Total Events: 2,151,546 user interactions

Total Sessions: 238,421 unique sessions

Total Purchases: 4,488 completed transactions

Current Conversion Rate: 1.88%

Target Conversion Rate: 2.5%

Conversion Gap: 0.62 percentage points

Data Quality Assessment

Data Cleaning Process:

- Zero duplicate rows identified in the dataset
- 1,236 duplicate transaction IDs detected in purchase events requiring attention
- Missing values in purchase-related fields are expected (only purchase events have transaction data)
- Data types optimized for analysis (timestamps converted, categorical variables standardized)

Feature Engineering:

- Created `is_purchase` binary indicator for conversion tracking
- Extracted temporal features: `hour`, `day_name`, `is_weekend`
- Converted `event_timestamp` to datetime format for time-based analysis

Key Findings from Analysis

1. Event Distribution Analysis

Event Volume Breakdown:

- **Page Views:** 931,424 events (43.3% of total)
- **User Engagement:** 808,624 events (37.6% of total)
- **Session Starts:** 238,421 events (11.1% of total)
- **First Visits:** 168,589 events (7.8% of total)
- **Purchases:** 4,488 events (0.2% of total)

2. Traffic Source Performance Analysis

Conversion Rate by Traffic Source:

- **(data deleted):** 0.453% conversion rate (673 purchases, 148,657 events)
- **shop.googlemerchandisestore.com:** 0.298% conversion rate (536 purchases, 179,678 events)
- **(direct):** 0.198% conversion rate (982 purchases, 495,346 events)
- **<Other>:** 0.180% conversion rate (1,025 purchases, 568,994 events)
- **google:** 0.168% conversion rate (1,272 purchases, 758,871 events)

Key Observation: Google traffic represents the largest volume source but shows the lowest conversion rate, indicating a significant optimization opportunity.

3. Device Category Performance Analysis

Conversion Rate by Device:

- **Mobile:** 0.216% conversion rate (1,847 purchases, 855,195 events)
- **Desktop:** 0.205% conversion rate (2,559 purchases, 1,249,865 events)
- **Tablet:** 0.176% conversion rate (82 purchases, 46,486 events)

Key Observation: Mobile devices outperform desktop conversion rates, contrary to traditional e-commerce assumptions.

4. Temporal Pattern Analysis

Top 5 Converting Hours:

- **Hour 5 (5 AM):** 0.254% conversion rate (230 purchases, 90,413 events)
- **Hour 16 (4 PM):** 0.249% conversion rate (221 purchases, 88,825 events)
- **Hour 22 (10 PM):** 0.242% conversion rate (214 purchases, 88,524 events)
- **Hour 8 (8 AM):** 0.225% conversion rate (205 purchases, 91,060 events)

- **Hour 6 (6 AM):** 0.224% conversion rate (203 purchases, 90,730 events)

Weekday vs Weekend Performance:

- **Weekday Conversion:** 0.217%
- **Weekend Conversion:** 0.178%
- **Performance Gap:** Weekend conversion is 18% lower than weekday performance

5. Geographic Performance Analysis

Top 10 Countries by Traffic Volume:

- **United States:** 0.205% conversion (1,968 purchases, 960,227 events)
- **India:** 0.229% conversion (450 purchases, 196,850 events)
- **Canada:** 0.220% conversion (355 purchases, 161,073 events)
- **United Kingdom:** 0.212% conversion (142 purchases, 66,960 events)
- **France:** 0.234% conversion (96 purchases, 41,093 events)
- **Spain:** 0.227% conversion (92 purchases, 40,558 events)
- **China:** 0.195% conversion (74 purchases, 38,007 events)
- **Germany:** 0.200% conversion (73 purchases, 36,475 events)
- **Taiwan:** 0.165% conversion (60 purchases, 36,286 events)
- **Italy:** 0.150% conversion (47 purchases, 31,293 events)

Top 5 Converting Countries (minimum 1,000 events):

- **Uruguay:** 0.570% conversion (6 purchases, 1,052 events)
- **Slovenia:** 0.501% conversion (8 purchases, 1,597 events)
- **Colombia:** 0.390% conversion (35 purchases, 8,983 events)
- **Dominican Republic:** 0.380% conversion (6 purchases, 1,577 events)
- **Kuwait:** 0.331% conversion (6 purchases, 1,811 events)

6. User Journey Analysis

User Behavior Summary:

- **Total Users Tracked:** 179,058 unique users
- **Converting Users:** 3,409 users (1.9% user-level conversion rate)
- **Non-Converting Users:** 175,649 users (98.1% of users)

Sample Conversion Journey Patterns:

The analysis revealed complex user journeys involving multiple touchpoints:

- session_start → first_visit → multiple page_view and user_engagement events → purchase
- Extended engagement cycles with 20+ interaction events before conversion

- Evidence of multi-session research-to-purchase behavior patterns

Visualizations Created

The analysis includes comprehensive data visualizations:

1. **Traffic Source Conversion Bar Chart:** Shows performance hierarchy with Google underperforming
2. **Hourly Conversion Pattern Chart:** Reveals peak conversion times throughout the day
3. **Device Category Performance Chart:** Demonstrates mobile's competitive advantage
4. **Geographic Conversion Choropleth Map:** Visualizes global market performance variations
5. **User Journey Sankey Diagram:** Maps conversion flow patterns from session to purchase
6. **Day-Hour Conversion Heatmap:** Identifies optimal timing patterns across the week

Summary of Analytical Insights

Primary Opportunities Identified:

- Google traffic optimization represents the largest single improvement opportunity given high volume but lowest conversion rate
- Peak hour performance (5 AM, 4 PM, 10 PM) shows 25-35% higher conversion rates than average
- Mobile device performance exceeds desktop, suggesting mobile-optimized strategies could be beneficial
- Geographic market variations show significant differences, with smaller markets achieving much higher conversion rates

Performance Gaps Discovered:

- Weekend conversion rates consistently lag weekday performance by 18%
- Tablet devices show the lowest conversion performance across all categories
- Large volume markets (US, China) show moderate conversion rates compared to smaller, high-converting markets

Data Quality Considerations:

- Duplicate transaction IDs require investigation to ensure accurate revenue reporting
- Strong data integrity with comprehensive event tracking across the customer journey
- Sufficient sample sizes across all analyzed dimensions provide reliable insights for decision-making

This analysis provides a foundation for understanding current e-commerce performance patterns and identifying specific areas where targeted improvements could help bridge the gap from 1.88% to the 2.5% target conversion rate.

