

Digital Marketing Performance Analysis: Facebook vs. AdWords (A/B Testing)

Business Problem

- **Primary Objective:** Maximize the return on investment (ROI) for our clients' advertising campaigns.
- **Challenge:** Determine which platform—Facebook or AdWords—yields better results in terms of clicks, conversions, and overall cost-effectiveness following two distinct ad campaigns.
- **Goal:** Identify the most effective platform to allocate resources more efficiently and optimize advertising strategies to deliver better outcomes for clients.

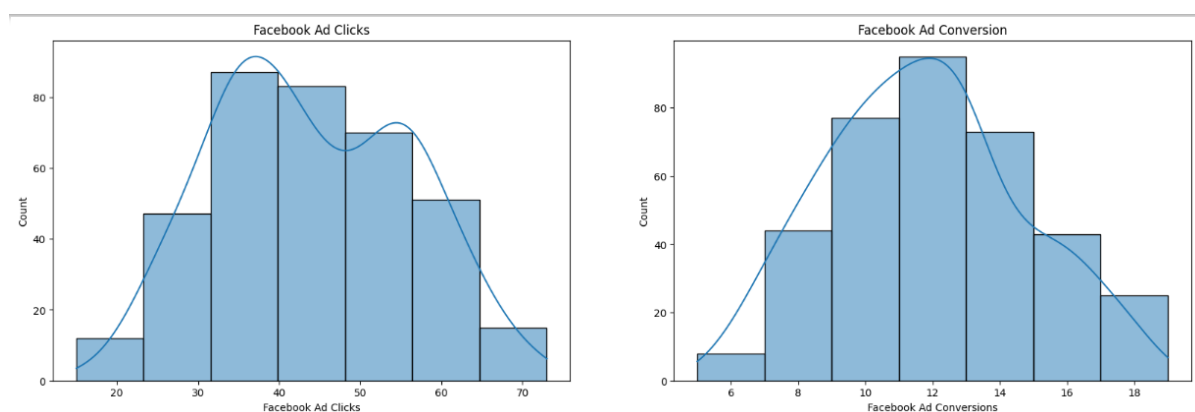
Research Questions

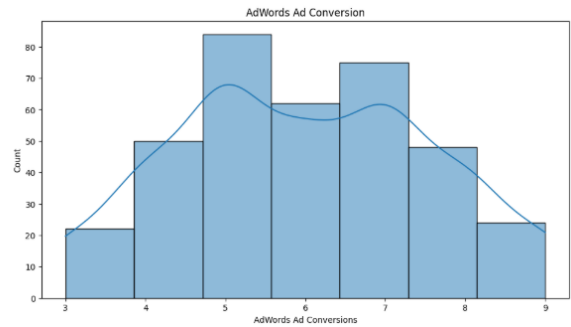
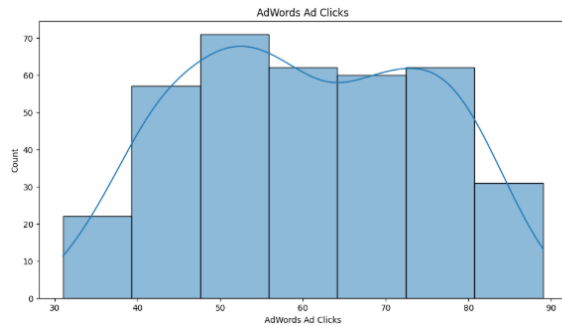
- Which ad platform is more effective in terms of conversions, clicks, and overall cost-effectiveness?
- Do more clicks on the ad really lead to more sales?
- At what times of the month or days of the week do we observe the conversions?
- How does the Cost Per Conversion (CPC) trend over time?
- Is there a long-term equilibrium relationship between advertising spend and conversion rates that suggests a stable, proportional impact of budget changes on conversions over time?

Analysis and Findings

Data Overview & Distribution

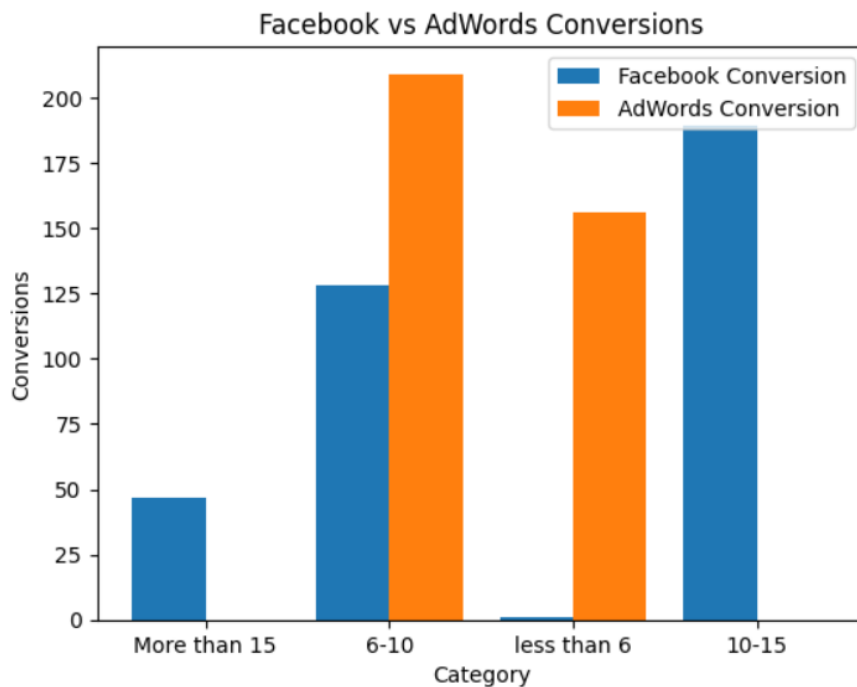
- All the histograms (Facebook Clicks, Facebook Conversions, AdWords Clicks, AdWords Conversions) are showing a somewhat **symmetrical shape**. This suggests that the number of clicks and conversions is relatively evenly distributed, with few outliers on either the high or low end.
- We cannot remove outliers because we want to analyse the marketing campaign for 365 days.



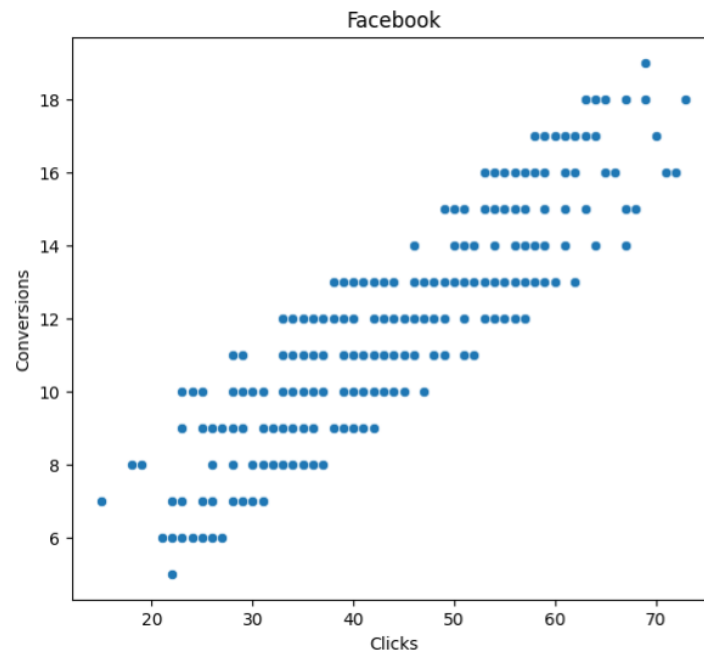


Campaign Comparison (A/B Test)

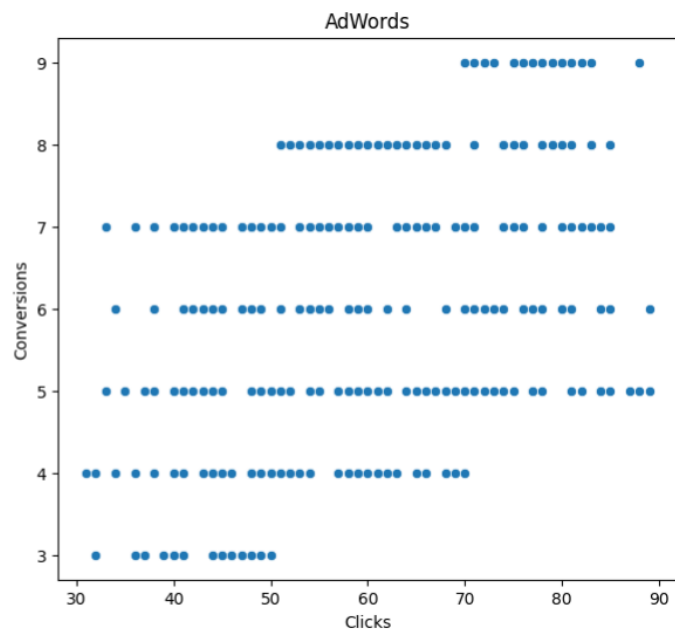
- Conversion Frequency:** The data suggests Facebook had **more frequent higher conversion days** than AdWords, which either had very low conversion rates (less than 6) or moderate ones (6-10).



- Correlation (Clicks vs. Sales):**
 - Facebook:** A correlation coefficient of **0.87** indicates a **strong positive linear relationship** between clicks on Facebook ads and sales. This suggests that Facebook ads are highly effective in driving sales.

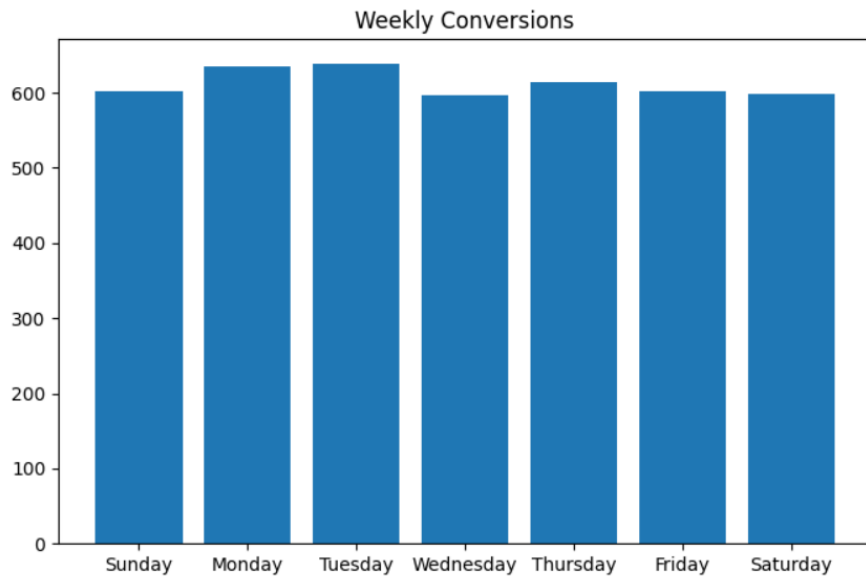


- **AdWords:** A correlation coefficient of **0.45** indicates a **moderate positive linear relationship** between clicks on AdWords ads and sales. While positive, it is not as strong as with Facebook ads.

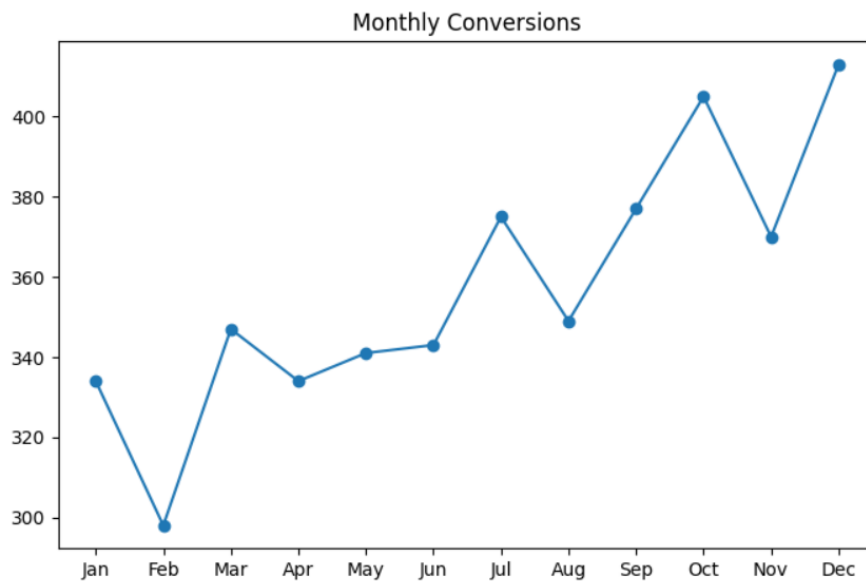


Time-Based Performance (Facebook)

- **Weekly Conversions: Mondays and Tuesdays** consistently exhibit the **highest conversion rates** compared to other days, suggesting that the beginning of the workweek sees heightened user engagement.

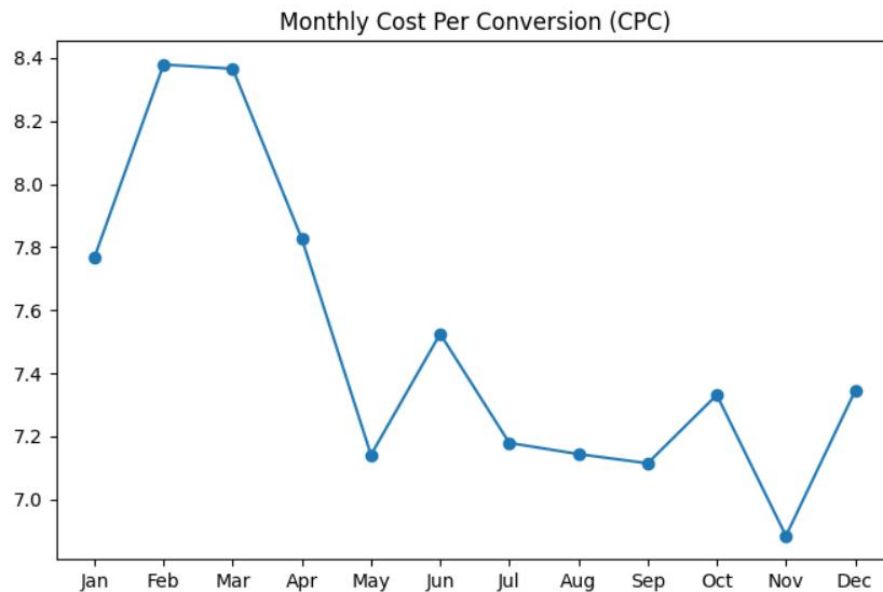


- Monthly Conversions:** Examining the monthly trend in conversions reveals an **overall upward trajectory**. However, February, April, May, June, August, and November experience a **decline in conversions** compared to neighbouring months.



Cost-Effectiveness and Stability

- Monthly CPC Trend:** **May and November** have the **lowest CPC values**, indicating potentially more cost-effective advertising or higher conversion rates during these periods. **February** has the highest CPC value.



- **Cointegration Test:** Since the p-value is significantly lower than the chosen significance level, we **reject the null hypothesis**. This indicates that there is a **long-term equilibrium relationship** between advertising spend (cost) and conversions.

Recommendations and Suggestions

- **Budget Prioritization:** Increasing investment in **Facebook ads** or optimizing their performance could potentially lead to even higher sales, given the strong correlation $r=0.87$.
- **Targeted Budget Allocation:** Consider allocating more advertising budget to months with historically **lower CPC values (e.g., May and November)** to maximize ROI.
- **Strategic Optimization:** Businesses can use the understanding of the stable relationship between cost and conversions (cointegration) to optimize their advertising strategies. By investing in campaigns that demonstrate a strong ROI and adjusting spending based on performance, companies can maximize conversions while minimizing costs.
- **AdWords Investigation:** The moderate correlation between clicks on AdWords ads and sales indicates that while it contributes, its effectiveness may be influenced by other factors. **Further analysis is needed** to identify these factors and optimize AdWords campaigns accordingly.
- **Addressing Conversion Variance:** The absence of any days with conversions between 10-15 and more than 15 in AdWords indicates a need to review what strategies were changed or what external factors could have influenced these numbers.