STRATEGIC DECISION-MAKING USING Power-BI

Tathagat Tiwari

1. Problem Statement:

To analyse the effectiveness of marketing campaigns across Facebook, Instagram, and Pinterest by examining impressions, clicks, conversions, and profit metrics. The aim is to identify platform-wise performance, cost efficiency, and areas of improvement

Objective

The primary objective of the dashboard analysis is to enhance the effectiveness of digital marketing campaigns by leveraging data-driven insights. Specifically, the goal is to:

1. Evaluate and compare platform-level performance to determine the ROI for Facebook, Instagram, and Pinterest campaigns.

2. Understand how impressions, clicks, and conversions are distributed across platforms and over time.

3. Identify patterns in customer engagement through CTR (Click-Through Rate) analysis and optimize ad spending based on profitability.

4. Use seasonal and weekly trends to guide decision-making and improve future campaign planning.

Key Issues

The analysis focuses on addressing the following challenges:

1. **Impressions Decline:**
   Impressions decreased by 3.92% compared to the previous month. This raises questions about ad visibility and reach.

2. **Suboptimal CTR:**
   The CTR is relatively low at 1.24%, indicating that while ads are being seen, they are not effectively engaging the audience.

3. **Cost vs. Profit Disparity:**
   Ad spend is distributed unevenly, with Facebook accounting for 43.87% of spending but yielding only 21.72% of profits, signaling inefficiencies in cost management.

4. **Platform-Specific Performance:**
   While Instagram contributes the most to profits (39.62%), Pinterest drives the highest percentage of impressions (29.81%), suggesting potential misalignment between reach and profitability.

5. **Conversion Gaps:**
   Conversion performance varies significantly across platforms, and identifying the root causes can help maximize ROI.

Proposed Approach

To address the above challenges, the analysis will follow a structured approach:

1. **Data Exploration:**
   - Break down metrics such as impressions, clicks, CTR, conversions, ad spending, and profits for each platform.
   - Compare performance metrics across platforms and devices (e.g., mobile, desktop).

2. **Trend Analysis:**
   - Examine trends in impressions, clicks, and conversions over time (monthly, seasonal).
   - Analyze weekly patterns to uncover actionable insights for daily optimization.

3. **Performance Insights:**
   - Evaluate the efficiency of ad spending by comparing costs and profits.
   - Identify the platforms and ad types delivering the best ROI.

4. **Recommendations:**
   - Suggest budget reallocation based on platform performance.
   - Propose optimization strategies to improve CTR and conversion rates.

Expected Outcomes

By conducting an in-depth analysis of the dashboard data, the following outcomes are anticipated:

1. **Improved Campaign ROI:**
   - Identify high-performing channels and allocate budgets to maximize returns.
   - Eliminate wasteful spending on underperforming platforms or ads.

2. **Enhanced Audience Engagement:**
   - Increase CTR by optimizing ad content and targeting strategies.
   - Leverage platform-specific insights to create tailored campaigns.

3. **Optimized Conversion Rates:**
   - Implement data-driven adjustments to improve conversion efficiency.
   - Identify audience segments most likely to convert and target them effectively.

4. **Actionable Insights for Growth:**
   - Provide a roadmap for long-term marketing success based on historical trends and data.
   - Empower decision-makers to make informed, strategic adjustments.

2. DATA REQUIREMENT

	A	B	C	D	E	F	G	H	I	J	K	L
1	data[City/Location]	data[Channel]	data[Device]	data[Ad]	data[Concatenated value]	[SumLatitude]	[SumLongitude]	[SumImpressions]	[SumCTR___]	[SumClicks]	[SumDaily_Average_CPC]	[SumSpend__GBP]
2	Birmingham	Facebook	Desktop	Collection	Fall-Birmingham-Collection	52.489471	-1.898575	1841	0.0172	31.6652	0.8625	27.311235
3	Birmingham	Facebook	Desktop	Discount	Fall-Birmingham-Discount	52.489471	-1.898575	1328	0.0091	12.0848	2.4725	29.879668
4	Birmingham	Facebook	Mobile	Collection	Fall-Birmingham-Collection	52.489471	-1.898575	1998	0.014	27.972	0.53	14.82516
5	Birmingham	Facebook	Mobile	Discount	Fall-Birmingham-Discount	52.489471	-1.898575	1886	0.0072	13.5792	0.85	11.54232
6	Birmingham	Instagram	Desktop	Collection	Fall-Birmingham-Collection	52.489471	-1.898575	1924	0.0187	35.9788	0.322	11.5851736
7	Birmingham	Instagram	Desktop	Discount	Fall-Birmingham-Discount	52.489471	-1.898575	1099	0.01188	13.05612	1.2305	16.06555566
8	Birmingham	Instagram	Mobile	Collection	Fall-Birmingham-Collection	52.489471	-1.898575	2639	0.01232	32.51248	0.83	26.9853584
9	Birmingham	Instagram	Mobile	Discount	Fall-Birmingham-Discount	52.489471	-1.898575	2064	0.00781	16.11984	1.19	19.1826096
10	Birmingham	Pinterest	Desktop	Collection	Fall-Birmingham-Collection	52.489471	-1.898575	1576	0.0155	24.428	0.598	14.607944
11	Birmingham	Pinterest	Desktop	Discount	Fall-Birmingham-Discount	52.489471	-1.898575	1325	0.0083	10.9975	1.104	12.14124
12	Birmingham	Pinterest	Mobile	Collection	Fall-Birmingham-Collection	52.489471	-1.898575	2360	0.0079	18.644	1.1	20.5084
13	Birmingham	Pinterest	Mobile	Discount	Fall-Birmingham-Discount	52.489471	-1.898575	2391	0.0085	20.3235	0.21	4.267935
14	London	Facebook	Desktop	Collection	Fall-London-Collection	51.50735	-0.12776	2004	0.0215	43.086	1.288	55.494768
15	London	Facebook	Desktop	Discount	Fall-London-Discount	51.50735	-0.12776	1999	0.0117	23.3883	2.484	58.0965372
16	London	Facebook	Mobile	Collection	Fall-London-Collection	51.50735	-0.12776	3566	0.0111	39.5826	0.31	12.270606
17	London	Facebook	Mobile	Discount	Fall-London-Discount	51.50735	-0.12776	3392	0.0136	46.1312	1.72	79.345664
18	London	Instagram	Desktop	Collection	Fall-London-Collection	51.50735	-0.12776	1898	0.01683	31.94334	0.897	28.65317598
19	London	Instagram	Desktop	Discount	Fall-London-Discount	51.50735	-0.12776	1625	0.01815	29.49375	1.6215	47.82411563
20	London	Instagram	Mobile	Collection	Fall-London-Collection	51.50735	-0.12776	2849	0.01628	46.38172	1.02	47.3093544
21	London	Instagram	Mobile	Discount	Fall-London-Discount	51.50735	-0.12776	2421	0.01012	24.50052	1.6	39.200832
22	London	Pinterest	Desktop	Collection	Fall-London-Collection	51.50735	-0.12776	1540	0.0189	29.106	1.2305	35.814933
23	London	Pinterest	Desktop	Discount	Fall-London-Discount	51.50735	-0.12776	2107	0.0113	23.8091	0.414	9.8569674
24	London	Pinterest	Mobile	Collection	Fall-London-Collection	51.50735	-0.12776	2934	0.0122	35.7948	0.33	11.812284
25	London	Pinterest	Mobile	Discount	Fall-London-Discount	51.50735	-0.12776	1596	0.0053	8.4588	0.57	4.821516

The data contains the following columns:

1. City Location
2. Channel
3. Device
4. Impression
5. CTR

3. DATA COLLECTION

Data Sources

The data in the dashboard originates from multiple digital marketing platforms and analytics tools, ensuring a comprehensive view of campaign performance. Here are the primary sources:

1. **Social Media Platforms:**

   o **Facebook Ads Manager:**

     ▪ Impressions, clicks, CTR, conversions, ad spending, and profit data related to campaigns on Facebook.

   o **Instagram Insights (via Facebook Ads Manager):**

     ▪ Campaign-level details for impressions, clicks, and conversions from Instagram.

   o **Pinterest Analytics:**

     ▪ Data for impressions, user engagement, conversions, and ad spending on Pinterest.

2. **Web Analytics Tools:**

   o **Google Analytics:**

     ▪ Conversion tracking across all channels to measure campaign performance on landing pages.

     ▪ Traffic sources and attribution to platforms.

   o **Pixel Tracking (Facebook and Pinterest):**

     ▪ Monitors user activity post-click to ensure conversion data is accurate.

3. **Ad Spend and ROI Management Tools:**

   o **Google Ads Data Hub:**

     ▪ Tracks ad spend and profitability trends across all campaigns.

   o **CRM System Integration:**

     ▪ Aligns conversion data with customer information to ensure a clear view of high-value users.

4. **Seasonal and Temporal Data Sources:**

   o **Internal Campaign Calendars:**

- Data from marketing schedules for Fall, Spring, and Summer campaigns.

- o **Historical Trends:**

  - Data from prior months and years to compare growth and decline trends.

---

2. Types of Data Collected

The data collected for the dashboard falls into several categories to cover all aspects of campaign performance:

1. **Performance Metrics:**

   - o **Impressions:**
     Total number of times ads were displayed to users across all platforms.

   - o **Clicks:**
     The total number of times users clicked on the ads.

   - o **Click-Through Rate (CTR):**
     Calculated as (Clicks / Impressions) × 100, indicating how engaging the ads are.

   - o **Conversions:**
     Actions completed by users after clicking on ads, such as purchases, signups, or downloads.

2. **Financial Metrics:**

   - o **Ad Spend:**
     Total cost of running ads on each platform.

   - o **Cost Per Conversion (CPC):**
     The cost incurred to generate one conversion.

   - o **Profits:**
     Revenue generated from campaigns after deducting the ad spend.

   - o **Profit Per Conversion:**
     Average profit gained from a single conversion.

3. **Channel-Level Metrics:**

   - o **Platform-Specific Insights:**
     Detailed performance breakdown for Facebook, Instagram, and Pinterest.

   - o **Device and Ad Type Insights:**
     Performance of ads on different devices (mobile, desktop) and ad formats.

4. **Trend and Temporal Data:**
   - Seasonal patterns (Fall, Spring, Summer).
   - Daily and weekly trends in impressions, CTR, and conversions.

---

4. DATA VALIDATION

To ensure the accuracy and reliability of the collected data, a robust validation process is crucial. Here's how it can be performed:

1. **Consistency Check:**
   - Verify consistency in key metrics (impressions, clicks, conversions) across data sources (e.g., Facebook Ads Manager, Google Analytics, and Pinterest Analytics).
   - Ensure uniform metric definitions, such as CTR being calculated as (Clicks / Impressions) × 100.

2. **Data Type Validation:**
   - Check that all data fields match their expected data types:
     - **Numerical Fields:** Impressions, clicks, conversions, ad spend, profits.
     - **Categorical Fields:** Platform (Facebook, Instagram, Pinterest), device type (mobile, desktop).
     - **Date/Time Fields:** Timestamped records for tracking daily, weekly, and seasonal trends.

3. **Cross-Source Verification:**
   - Compare key figures (e.g., total conversions or ad spend) reported by Facebook Ads Manager with Google Analytics to ensure accuracy.
   - Resolve discrepancies through manual checks with source files or platform dashboards.

---

2. Check for Missing Data

Objective:

Identify and address gaps in the data to avoid incomplete analysis.

Steps:

1. **Identify Missing Data:**

   o Use Power Query or SQL queries to highlight null, empty, or incomplete records in key fields like impressions, clicks, or conversions.

   o Example: Rows with missing ad spend but valid impressions are flagged for correction.

2. **Handle Missing Data:**

   o **Replace Missing Values:** For numerical data, calculate averages or use median values where appropriate.
   Example: If CTR is missing, recalculate using available impressions and clicks.

   o **Remove Records:** If critical fields like platform or date are missing, the record may be discarded.

3. **Check Completeness:**

   o Ensure that all platforms (Facebook, Instagram, Pinterest) are represented in the data.

---

3. Remove Duplicates

Objective:

Eliminate redundant data to ensure accurate aggregations and calculations.

Steps:

1. **Identify Duplicates:**

   o Run a query to check for duplicate rows based on key identifiers like ad ID, timestamp, and platform.

   o Example: If multiple rows for the same ad and date exist, they are flagged.

2. **Remove Duplicates:**

   o Retain only one instance of duplicate rows, preferably the one with the most complete information.

---

4. Outlier Detection

Objective:

Identify and handle anomalies in data that might distort analysis.

Steps:

1. **Detect Outliers in Numerical Fields:**

   o Analyze distributions for fields like impressions, clicks, CTR, and conversions.

   o Use statistical thresholds (e.g., values outside 1.5× the interquartile range) to flag anomalies.
   Example: A campaign with 10,000 impressions but only 1 click indicates a possible data issue.

2. **Handle Outliers:**

   o **Validate Outliers:** Cross-check flagged values with source data to confirm if they are errors.

   o **Correct or Exclude:** If outliers are confirmed as incorrect, replace with averages or remove the record.

---

5. Validate Relationships Between Data Fields

Objective:

Ensure logical consistency between related fields.

Steps:

1. **CTR Validation:**

   o Confirm that CTR aligns with the formula: (Clicks / Impressions) × 100.

2. **Cost Per Conversion Check:**

   o Validate that the cost per conversion matches the formula: (Ad Spend / Conversions).

3. **Platform-Level Aggregation:**

   o Ensure that platform totals (e.g., total impressions) match the sum of individual campaign data.

---

6. Cross-Check Data with Source

Objective:

Validate aggregated data in Power BI against raw data from sources.

Steps:

1. **Spot Checks:**

   o   Compare key figures (e.g., total conversions, ad spend) between Power BI and raw data sources like Facebook Ads Manager and Pinterest Analytics.

2. **Reconciliation Reports:**

   o   Generate detailed reconciliation reports to highlight discrepancies, if any, and resolve them.

---

7. Data Transformation

Objective:

Clean and prepare the data for efficient analysis in Power BI.

Steps:

1. **Standardize Metrics:**

   o   Convert all monetary values to a single currency if platforms report different currencies.

   o   Standardize date formats to ensure consistency in time-series analysis.

2. **Create Derived Metrics:**

   o   Generate additional fields such as:

      ▪   **ROI:** (Profits / Ad Spend) × 100.

      ▪   **Season Tags:** Assign seasonal categories (e.g., Fall, Spring) based on timestamps.

3. **Merge Datasets:**

   o   Integrate data from different platforms (Facebook, Instagram, Pinterest) into a unified table.

---

8. Final Validation

Objective:

Ensure that the cleaned and transformed data is ready for visualization and analysis.

Steps:

1. **Sanity Checks:**

    o Verify the total number of records matches the original dataset (after removing duplicates and invalid rows).

    o Confirm that calculated fields like CTR and Cost per Conversion match expected values.

2. **Dashboard Preview:**

    o Load the cleaned data into Power BI and preview charts to identify inconsistencies or errors.

3. **Stakeholder Review:**

    o Share initial visualizations and summaries with stakeholders to confirm data integrity and usability.

5. DATA CLEANING

Tool Used:
Power Query in Power BI.

- **Capabilities:** Filtering, merging, and transforming data.
- **Benefits:**

    o Intuitive interface for non-technical users.

    o Built-in support for detecting and correcting data errors.

    o Automatic updates for dynamic datasets.

6. TOOLS

Tools to be Used for Analysis and Visualization:

1. **Power BI:** For creating interactive dashboards and visualizations.

2. **Microsoft Excel:** For data cleaning, validation, and basic exploratory analysis.

7. DASHBOARDS

Key Components of the Power BI Dashboard

The dashboard is a comprehensive representation of marketing campaign performance across three platforms—Facebook, Instagram, and Pinterest. It provides insights into impressions, clicks, click-through rates (CTR), conversions, ad spend, and profits. Each component of the dashboard highlights specific aspects of campaign performance:

Key Metrics Explained

1. **Impressions (14.65M)**:
   - Total times ads were displayed to users across platforms.
   - Insights:
     - Pinterest accounts for 29.81% of impressions, Facebook for 37.14%, and Instagram for 33.05%.
     - A 3.92% decline in impressions from the previous month signals a possible reduction in reach or ad visibility.

2. **Clicks (181.59K)**:
   - Number of user interactions with ads.
   - Insights:
     - Clicks correlate with impressions but highlight effectiveness in engaging users.
     - Instagram leads with 68.61K clicks and the highest CTR (1.42%), while Pinterest lags with a CTR of 0.99%.

3. **CTR (1.24%)**:
   - Measures engagement: (Clicks / Impressions) × 100.
   - Insights:
     - Instagram outperforms other platforms in CTR, showing its ads resonate better with audiences.

4. **Conversions (40K)**:
   - Actions completed after clicking an ad (e.g., purchases, signups).
   - Insights:
     - A 3.39% increase in conversions suggests improved post-click engagement strategies.

5. **Ad Spend ($163.25K)**:
   - Total amount spent on running ads.
   - Insights:
     - Facebook accounts for the highest ad spend (43.87%), indicating an aggressive investment strategy.

6. **Profit ($1.57M)**:
   - Revenue generated after deducting ad spend.
   - Insights:

- Instagram drives the most profit (39.62%), followed by Pinterest (38.67%) and Facebook (21.72%).

7. **Trend Analysis**:

    ○ Seasonal variations show stable impressions and conversions in Spring and Summer, with a slight dip in Fall.

    ○ Weekly trends suggest higher engagement during weekdays (e.g., CTR peaks on Tuesdays and Thursdays).

Key Visualizations and Insights

1. **Impressions by Channel, Device, and Ad Type**:

    ○ Pie chart displaying distribution of impressions across platforms.

    ○ Insights:

        ▪ Facebook dominates impressions but is not the most profitable platform.

2. **Clicks and CTR by Channel**:

    ○ Bar chart comparing CTR and clicks for each platform.

    ○ Insights:

        ▪ Instagram performs the best in engagement, requiring further investment.

3. **Conversions by Channel**:

    ○ Pie chart showcasing the share of conversions for each platform.

    ○ Insights:

        ▪ Instagram leads in driving actionable results.

4. **Ad Spend vs. Profit by Channel**:

    ○ Pie chart comparing ad spend with profits across platforms.

    ○ Insights:

        ▪ Facebook's ad spend is disproportionate to its profit contribution, signaling inefficiencies.

5. **Trends Over Time**:

    ○ Line chart displaying impressions and CTR over the year.

    ○ Insights:

- Impressions are stable, but CTR variations suggest periodic campaign adjustments.

Univariate, Bivariate, and Multivariate Analysis

1. Univariate Analysis

Univariate analysis focuses on examining a single variable at a time to understand its distribution and characteristics.

- **Example Variables:**
  - **Impressions:** Analysis reveals a 3.92% decline compared to the previous month.
  - **CTR:** Average CTR is 1.24%, with Instagram leading at 1.42%.
- **Insights:**
  - Facebook contributes the highest share of impressions but has a relatively low CTR (1.29%).
  - Univariate analysis helps assess performance benchmarks for each variable independently.

---

2. Bivariate Analysis

Bivariate analysis examines the relationship between two variables to uncover associations.

- **Example Relationships:**
  - **Clicks vs. Impressions:**
    - A direct correlation indicates that platforms with higher impressions (e.g., Facebook) also tend to generate more clicks.
    - However, Pinterest shows relatively low clicks despite significant impressions, highlighting lower ad engagement.
  - **Ad Spend vs. Profit:**
    - Facebook has the highest ad spend but generates the lowest profit, showing inefficiency.
    - Instagram demonstrates a favorable relationship, where moderate ad spend yields the highest profit.
- **Insights:**

- CTR varies significantly across platforms, with Instagram showing a higher engagement rate.
- The bivariate analysis highlights areas where performance can be improved, such as Facebook's cost-effectiveness.

---

3. Multivariate Analysis

Multivariate analysis explores the interaction among three or more variables to uncover complex patterns and relationships.

- **Example Relationships:**
  - **Impressions, CTR, and Profit by Channel:**
    - Although Facebook leads in impressions, its lower CTR translates to reduced profits compared to Instagram and Pinterest.
  - **Seasonal Trends (Impressions, CTR, and Conversions):**
    - Conversions are consistent in Spring and Summer, with a slight dip in Fall.
    - Weekly patterns show CTR peaks on weekdays, while weekends exhibit lower engagement.
- **Insights:**
  - Instagram demonstrates strong synergy between impressions, CTR, and profits, making it the most effective platform for campaigns.
  - Seasonal and weekly trends help in planning future campaigns to target high-engagement periods.

8. STORYTELLING

The dashboard serves as a comprehensive narrative of the marketing campaign's performance. It highlights the interplay between key metrics like impressions, clicks, conversions, and profits across three major platforms—Facebook, Instagram, and Pinterest. The data paints a story of engagement trends, platform efficiency, and profitability, offering actionable insights for optimization. Here's the breakdown:

Key Themes in the Storytelling

1. **Campaign Reach (Impressions and Clicks):**

- o Facebook leads in impressions (37.14%) but falls behind Instagram in engagement (clicks and CTR). Pinterest lags in CTR but still garners significant impressions (29.81%).
- o The overall campaign reach has slightly declined (-3.92%) compared to the previous month, prompting a need to revisit ad strategies.

2. **Engagement and Conversions:**

- o Instagram is the most engaging platform, with the highest CTR (1.42%) and conversions (38.73%).
- o Pinterest, despite its significant reach, underperforms in clicks and conversions, signaling low audience interaction.

3. **Cost Efficiency:**

- o Facebook has the highest ad spend (43.87%) but contributes the least to profit (21.72%).
- o Instagram balances cost and performance, driving the highest profit share (39.62%).

4. **Trends Over Time and Seasonal Variations:**

- o Engagement is consistent in Spring and Summer, with dips in Fall. Weekly trends show higher engagement on weekdays (especially Tuesday and Thursday), suggesting optimal days for running ads.

Challenges Identified

1. **Disproportionate Ad Spend:**

- o Facebook's high ad spend is not translating into proportional profits, indicating inefficiencies in its campaign performance.

2. **Underperformance of Pinterest:**

- o Despite significant impressions, Pinterest lags in clicks and conversions, showing poor audience engagement.

3. **Declining Impressions:**

- o Overall impressions have declined by 3.92% compared to the previous month, signaling reduced visibility.

4. **CTR Variations:**

- o CTR varies significantly across platforms, with Facebook and Pinterest underperforming compared to Instagram.

5. **Seasonal and Weekly Inconsistencies:**

- o Campaign engagement dips during weekends and in Fall, highlighting missed opportunities to boost performance during these periods.

Key Insights

1. **Platform-Specific Performance:**

   o Instagram is the most effective platform, excelling in CTR, conversions, and profit contribution.

   o Facebook is suitable for generating reach (impressions) but needs optimization to improve cost efficiency.

2. **Profitability Analysis:**

   o Pinterest contributes significantly to profits (38.67%) despite its low engagement metrics, suggesting niche audience success.

3. **Seasonal and Weekly Trends:**

   o Campaigns perform best in Spring and Summer, while engagement peaks during weekdays, particularly Tuesday and Thursday.

4. **Cost per Conversion:**

   o At $4.06 per conversion, cost efficiency is average, with room for improvement, particularly for Facebook campaigns.

Recommendations

1. **Optimize Facebook Campaigns:**

   o Reassess Facebook's ad strategy to improve CTR and cost efficiency. Focus on better targeting and ad creatives.

2. **Enhance Pinterest Engagement:**

   o Experiment with interactive and visually engaging content to increase audience interaction on Pinterest.

3. **Allocate More Budget to Instagram:**

   o Increase investment in Instagram campaigns due to their high CTR, conversions, and profitability.

4. **Focus on High-Engagement Days:**

   o Concentrate ad spends and efforts on high-performing days (Tuesday and Thursday) to maximize ROI.

5. **Seasonal Adjustments:**

   o Ramp up campaigns during Spring and Summer while experimenting with new strategies to boost Fall engagement.

6. **Address Declining Impressions:**

- o Explore new audience segments, improve ad quality, and increase ad frequency to regain lost impressions.

7. **Continuous Monitoring:**

    - o Set up automated alerts for CTR, conversion rates, and costs to quickly identify and address performance anomalies.

8. **A/B Testing:**

    - o Run A/B tests to compare the effectiveness of different ad formats, visuals, and call-to-action strategies across platforms.

Conclusion

The dashboard provides a clear narrative about the performance of digital marketing campaigns across platforms. By addressing identified challenges and implementing the recommendations, businesses can enhance audience engagement, optimize cost efficiency, and maximize overall profitability. Regular performance tracking and iterative adjustments based on insights will ensure sustained campaign success.