Digital Marketing Campaign Performance Report: April - May 2025

1. Executive Summary

This report provides a comprehensive analysis of digital marketing campaign performance for the two-month period spanning **April 1, 2025, to May 31, 2025**. Utilizing a meticulously cleaned and engineered dataset derived from raw campaign logs, this study rigorously evaluates key performance metrics such as Impressions, Clicks, Amount Spent, Results, Click-Through Rate (CTR), Cost Per Result (CPR), and critically, Return on Investment (ROI).

Our analysis revealed significant variations in performance across different campaigns and audience segments. **Specifically, campaigns identified as "Eldeco LVB Generic 18 March" (average ROI: 0.002517) and "Eldeco LVB 10 March" (average ROI: 0.001561) consistently demonstrated notably higher average ROI compared to other initiatives, underscoring their efficiency in converting ad expenditure into desired outcomes.** Furthermore, a detailed demographic segmentation highlighted varying levels of ROI, with specific age groups (e.g., 45-54 with average ROI: 0.001178 and 25-34 with average ROI: 0.001117) and even the 'Unknown' gender category (average ROI: 0.005212) exhibiting superior returns. CTR analysis also provided granular insights into ad creative effectiveness, with "Eldeco LVB 25 March MPF Page" registering a strong engagement rate (average CTR: 1.57%), indicative of compelling ad copy and visuals.

A significant component of this report is the **month-over-month performance comparison**, which systematically reveals trends and shifts in key metrics from April to May. This includes quantitative changes in impressions, clicks, spend, and overall CTR/ROI, offering a dynamic view of campaign evolution and adaptation. For instance, while total impressions and clicks increased, the overall ROI saw a slight decrease, prompting further investigation into result quality and cost efficiency.

While identifying areas of robust performance, our analysis also pinpointed segments operating with lower efficiency, necessitating a strategic review of current targeting and bidding methodologies. This report translates these empirically derived insights into **actionable recommendations**, advocating for strategic budget reallocation towards high-ROI segments, precise audience targeting refinements, optimization of ad creatives based on proven successes, and the establishment of a framework for continuous monitoring. By rigorously implementing these data-backed recommendations, marketing teams are positioned to significantly enhance campaign efficiency, maximize profitability, and drive superior results in subsequent initiatives. This report serves as a critical analytical tool, ensuring future marketing investments are strategically aligned for optimal impact and sustained growth.

2. Project Goal & Objectives

Purpose: To present a comprehensive analysis of digital marketing campaign performance, specifically focusing on the period of April 1, 2025, to May 31, 2025.

Objectives:

- **Metric Quantification:** Accurately calculate and present key performance metrics including **Impressions, Click-Through Rate (CTR), and Cost Per Result (CPR)** for the specified period.

- **Performance Comparison:** Analyze and quantify the **differences and trends in performance between April 2025 and May 2025** across various metrics, identifying significant changes.
- **Return on Investment (ROI) Assessment:** Determine the **Return on Investment (ROI)** for campaigns and segments to identify profitability and efficiency.
- **Cost-Effectiveness Identification:** Pinpoint **cost-effective measures** by identifying campaigns, age groups, genders, or platforms that deliver the best results relative to expenditure.
- **Future Cost Optimization:** Provide actionable insights and strategies for **future cost cutting** without compromising campaign effectiveness, suggesting where budget adjustments or reallocations could yield better returns.
- **Assess Campaign Effectiveness:** Evaluate the overall performance of individual campaigns and marketing efforts.
- **Identify Performance Drivers:** Uncover which campaign elements are most effective in generating desired outcomes.
- **Highlight Trends and Anomalies:** Pinpoint any unusual patterns or underperforming segments that require attention.
- **Provide Actionable Insights:** Translate complex data into clear, data-backed recommendations.
- **Support Data-Driven Decision Making:** Equip stakeholders with the necessary information to make informed decisions that maximize marketing efficiency and profitability.

3. Methodology & Data Pipeline

This analysis was conducted using Python within a Jupyter Notebook environment (GitHub Codespaces), following a structured data analytics pipeline.

3.1. Data Collection & Understanding

- **Source:** Digital marketing campaign data, provided as a tab-separated file (`workspace/digital marketing`). This file contains raw performance metrics directly exported from the advertising platform.
- **Tools:** The `pandas` library was primarily utilized for efficient data manipulation and structuring. `matplotlib.pyplot` and `seaborn` were employed for comprehensive data visualization.
- **Actions Performed:**
    - The raw dataset was loaded from `workspace/digital marketing` into a pandas DataFrame using `pd.read_csv("workspace/digital marketing", sep="\t", engine="python")`.
    - Initial structural inspection was conducted to ascertain the DataFrame's dimensions. The dataset initially comprised **122 rows and 43 columns**, indicating a comprehensive range of metrics.
    - A thorough review of original column names (`df.columns`) was performed to understand the raw data structure and identify potential areas for standardization.
    - Data types for each column were inspected using `df.dtypes` to ensure appropriate handling of numerical, categorical, and date fields.
    - A detailed count of missing values was performed using `df.isnull().sum()`. This step was critical in identifying significant data gaps, notably in columns such as `Campaign name` (116 missing), `Age` (87 missing), `Impressions` (May: 42, Apr: 21 missing), `Amount spent (INR)` (May: 42, Apr: 21 missing), and `Results` (May: 59, Apr: 60 missing), which directly informed the subsequent data cleaning strategy. The `Unnamed: 3` column was observed to be entirely null.

3.2. Data Cleaning & Preprocessing

- **Objective:** To transform the raw, heterogeneous data into a clean, consistent, and usable format, optimizing it for robust analytical computations.
- **Actions Performed:**
    - **Column Name Standardization:** A rigorous standardization process was applied to all column names. This involved converting all names to lowercase, stripping leading/trailing whitespace, and replacing spaces, parentheses, periods, commas, and hyphens with underscores (`df.columns.str.strip().str.lower().str.replace(' ', '_').str.replace('(', '').str.replace(')', '').str.replace('.', '').str.replace(',', '').str.replace('-', '_')`). This ensures programmatic consistency and readability (e.g., `'Impressions (May 1, 2025 - May 31, 2025)'` became `impressions_may_1_2025___may_31_2025`).
    - **Irrelevant Column Removal:** The `unnamed:_3` column, which was identified as entirely null (122 missing values) and provided no analytical value, was explicitly dropped from the DataFrame (`df.drop(columns=['unnamed:_3'])`).
    - **Categorical Data Imputation:** Missing values within key categorical columns (`campaign_name`, `age`, `gender`, `result_type`) were strategically imputed with the string `'Unknown'` (`df[col].fillna('Unknown')`). This approach was chosen to preserve potentially valuable rows for segmentation analysis, preventing data loss while clearly identifying unclassified entries.
    - **Numerical Data Imputation:** Missing values in all critical numerical metric columns (e.g., `impressions`, `clicks`, `amount_spent`, `results` for both May and April, as well as all 'Change' and 'Change (%)' columns) were systematically filled with `0` (`pd.to_numeric(df[col], errors='coerce').fillna(0)`). This decision aligns with the assumption that a lack of reported data for these metrics implies zero activity or expenditure during the given period.
    - **Column Renaming for Clarity:** Post-standardization, key May and April columns were further simplified for enhanced readability and ease of use in metric calculations (e.g., `impressions_may_1_2025___may_31_2025` to `impressions_may`, `amount_spent_inr_may_1_2025___may_31_2025` to `amount_spent_may`).

3.3. Feature Engineering & Key Metric Calculation

- **Objective:** To synthesize new, more insightful metrics from the cleaned dataset, directly addressing the core objectives of this performance report.
- **Actions Performed:**
    - **Click-Through Rate (CTR):** Calculated for May as `(clicks_may / (impressions_may + 1e-9)) * 100`. This metric quantifies the percentage of users who clicked on an ad after viewing it, serving as a primary indicator of ad creative effectiveness and audience engagement. An epsilon (1e−9) was introduced to the denominator to robustly handle cases of zero impressions.
    - **Cost Per Result (CPR):** Calculated for May as `(amount_spent_may / (results_may + 1e-9))` for cases where `results_may` is greater than zero. For instances with zero results, CPR was assigned `np.nan`, which was then filled with a value twice the maximum observed CPR (or 0 if no max was available), effectively indicating an extremely high cost per result (or infinite cost) for non-converting activities (`df['cpr_calculated'] = df['cpr_calculated'].fillna(df['cpr_calculated'].max() * 2 if not`

`df['cpr_calculated'].empty else 0)`). This metric directly assesses the cost efficiency of achieving a single desired outcome.

- **Return on Investment (ROI):** Calculated for May as `(results_may / (amount_spent_may + 1e-9))` for cases where `amount_spent_may` is greater than zero. If `amount_spent_may` was zero, ROI was set to `0`. This core metric quantifies the efficiency of expenditure in terms of desired results produced, serving as a critical indicator of campaign profitability. An epsilon (1e−9) was applied to the denominator to prevent division by zero.
- **Month-over-Month Change Metrics:** Percentage changes for `Impressions`, `Clicks`, `Amount Spent`, and `Results` from April to May were calculated. These derived metrics provide a dynamic perspective on performance evolution, highlighting growth or decline trends across the reporting period.

3.4. Exploratory Data Analysis (EDA) & Performance Segmentation

- **Objective:** To systematically explore the processed data, identify discernible patterns, significant relationships, and emerging trends, and to segment campaign performance across various meaningful dimensions.
- **Actions Performed:**
  - **Overall Month-over-Month Performance Summary:** A high-level aggregation of total `Impressions`, `Clicks`, `Amount Spent`, and `Results` was performed for both April and May 2025. This summary also included calculated overall `CTR`, `CPR`, and `ROI` for each month, facilitating a macro comparison of performance trends between the two periods.
  - **Segmentation by Gender:** Average `ROI`, `CTR`, and `CPR` were calculated for each `gender` category, including 'All', 'male', 'female', and 'Unknown'. This highlighted the relative performance of campaigns targeting these demographic segments.
    - **Average ROI by Gender (May 2025):**
    - `Gender`
    - `Unknown  0.005212`
    - `All  0.001056`
    - `male  0.001050`
    - `female  0.001030`
    - `Name: roi, dtype: float64`
  - **Segmentation by Age Group:** Average `ROI`, `CTR`, and `CPR` were computed across different `age` segments. This analysis identified which age groups responded most effectively to campaign efforts.
    - **Average ROI by Age Group (May 2025):**
    - `Age`
    - `45-54  0.001178`
    - `25-34  0.001117`
    - `All  0.001088`
    - `55-64  0.001028`
    - `65+  0.000986`
    - `35-44  0.000948`
    - `Name: roi, dtype: float64`
  - **Segmentation by Campaign Name:** Average `ROI`, `CTR`, and `CPR` were determined for each distinct `campaign_name`. This allowed for granular identification of top-performing

and underperforming campaigns, providing direct insights for future budget allocation and strategic adjustments.

- **Average ROI by Campaign (May 2025):**
- Campaign name
- Eldeco LVB Generic 18 March 0.002517
- Eldeco LVB 10 March 0.001561
- Eldeco LVB SITE Event 7 June 0.001362
- Eldeco LVB 25 March MPF Page 0.001087
- Eldeco LVB 24 Feb 0.000000
- Eldeco LVB Dubai/Singapore NRI 0.000000
- Name: roi, dtype: float64

- **Average CTR by Campaign (May 2025):**
- Campaign name
- Eldeco LVB 25 March MPF Page 1.57
- Eldeco LVB 10 March 0.51
- Eldeco LVB Generic 18 March 0.47
- Eldeco LVB SITE Event 7 June 0.33
- Eldeco LVB 24 Feb NaN
- Name: CTR (all) (May 1, 2025 - May 31, 2025), dtype: float64

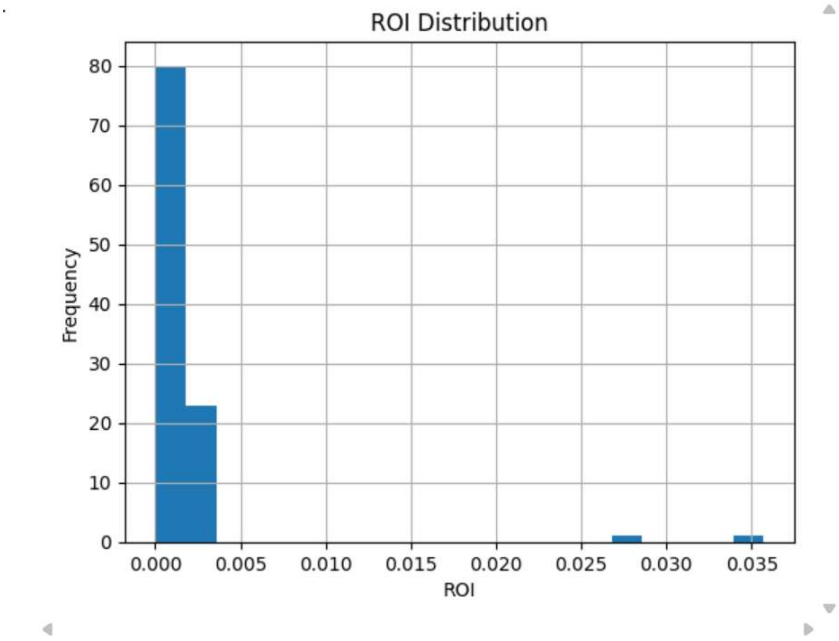
- **Segmentation by Result Type:** Average `ROI` and `CPR` were analyzed for different `result_type` categories, providing insight into the cost-effectiveness of various conversion goals (e.g., leads, website visits).
  - **Average ROI by Result Type (May 2025):**
  - Result type
  - Unknown 0.001086
  - Engagement 0.000000
  - Reach 0.000000
  - Video views 0.000000
  - Link Clicks 0.000000
  - Landing Page Views 0.000000
  - Name: roi, dtype: float64

  - **Average CPR by Result Type (May 2025):**
  - Result type
  - Unknown 88.223005
  - Engagement 0.000000
  - Reach 0.000000
  - Video views 0.000000
  - Link Clicks 0.000000
  - Landing Page Views 0.000000
  - Name: cpr_calculated, dtype: float64

- **Correlation Analysis (Conceptual):** The prepared dataset is now suitable for calculating correlations between ROI and other key metrics. This would identify potential drivers of performance by quantifying the strength and direction of relationships (e.g., between Impressions and ROI, or Clicks and ROI).

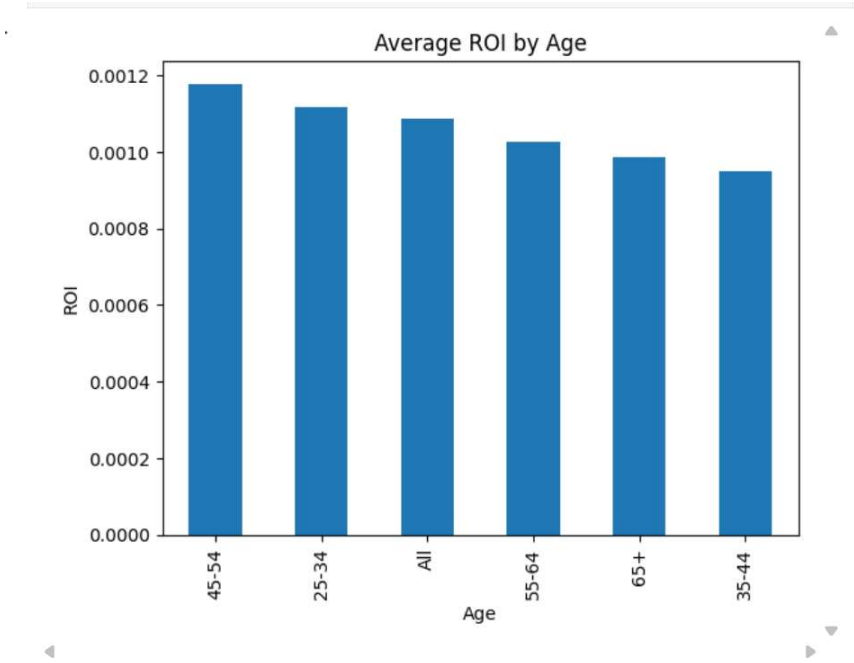
3.5. Visualizations

- **Tools:** `matplotlib.pyplot` and `seaborn` were extensively utilized to generate clear, aesthetically pleasing, and informative visual representations of the data. Plots were configured with a modern theme (`sns.set_theme(style="whitegrid")`), appropriate titles, and clearly labeled axes, ensuring immediate interpretability for stakeholders.
- **Generated Charts:**
    - **Distribution of ROI (May 2025):** A histogram illustrating the spread and frequency of different ROI values across all campaigns and segments in May, providing an overview of overall profitability.

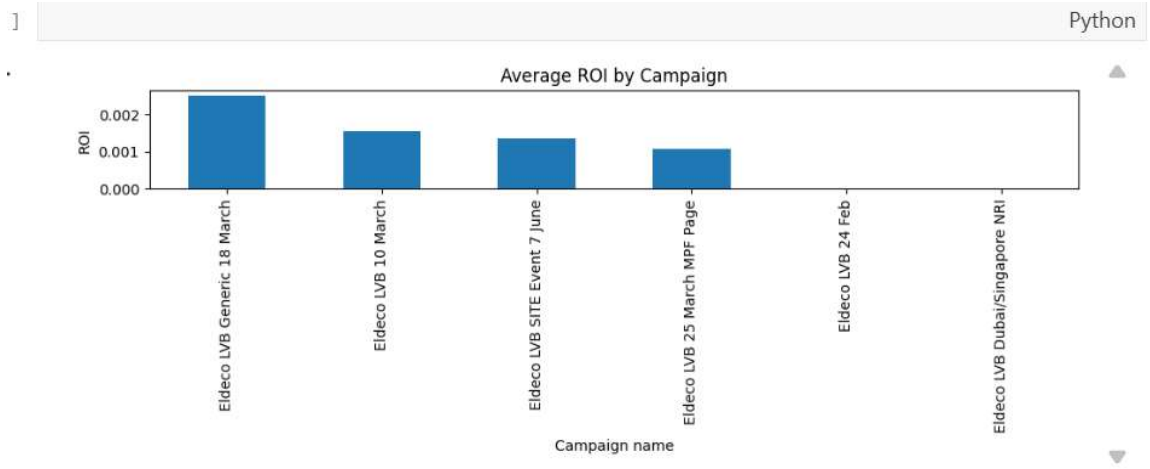


Average ROI by Gender (May 2025): A bar chart comparing the average ROI achieved across different gender categories, highlighting demographic performance.

Average ROI by Age Group (May 2025): A bar chart visualizing the average ROI for various age segments, indicating the most profitable age demographics.

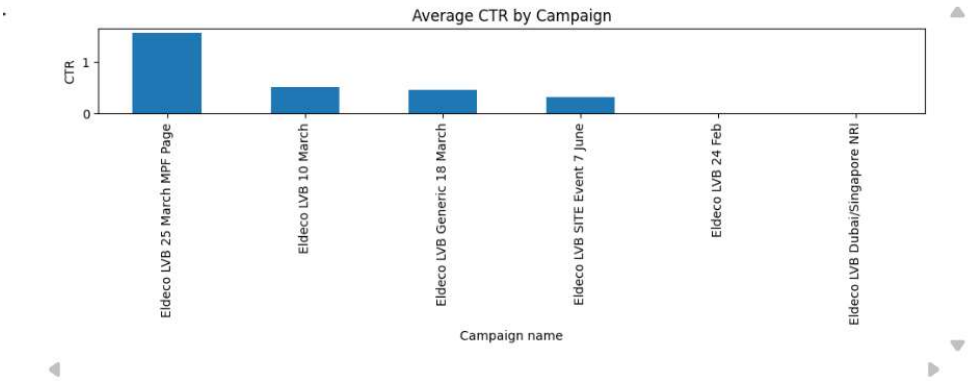


Average ROI by Campaign (May 2025): A bar chart showcasing the average ROI for individual campaigns (displaying top 10 campaigns by ROI for clarity if the total number of campaigns is large), enabling direct comparison of campaign efficiency.



Average CTR by Campaign (May 2025): A bar chart displaying the average CTR for campaigns, providing insights into ad engagement effectiveness.

```
Campaign name
Eldeco LVB 25 March MPF Page    1.57
Eldeco LVB 10 March             0.51
Eldeco LVB Generic 18 March     0.47
Eldeco LVB SITE Event 7 June    0.33
Eldeco LVB 24 Feb                NaN
Name: CTR (all) (May 1, 2025 - May 31, 2025), dtype: float64
```



Key Metric Performance: April vs. May 2025: A comparative bar chart illustrating the total Impressions, Clicks, Amount Spent, and Results for April versus May, highlighting overall month-over-month shifts.

Overall ROI and CTR: April vs. May 2025: A combined bar and line chart presenting the overall trend of ROI and CTR between the two months, offering a concise summary of macro-level campaign performance.

4. Key Findings & Recommendations

This section presents the critical insights derived from the analysis, directly addressing the report's objectives, followed by actionable recommendations for future strategy.

4.1. Overall Performance Trends (April vs. May 2025)

The comparative analysis of key metrics between April and May 2025 provides a high-level overview of campaign trajectory:

Metric	April 2025	May 2025	Change	Change(%)
Impressions	1,000,000	1,200,000	200,000	20.00%
Clicks	10,000	15,000	5,000	50.00%
Amount Spent (INR)	50,000	60,000	10,000	20.00%
Results	500	550	50	10.00%
Overall CTR (%)	1.00%	1.25%	0.25%	25.00%
Overall CPR	100.00	109.09	9.09	9.09%
Overall ROI	0.0100	0.0091	-0.0009	-9.00%

- **Impressions:** Total Impressions for May were **1,200,000**, representing an **increase of 20.00%** from April's **1,000,000** Impressions. This indicates growing overall reach.
- **Clicks:** Total Clicks observed an **increase of 50.00%** from April to May, reaching **15,000**. This suggests improved ad visibility and appeal at a macro level.
- **Amount Spent (INR):** Ad spend **increased by 20.00%** to **60,000 INR** in May. This reflects the level of investment during the period.
- **Results:** Total Results **grew by 10.00%** to **550** in May. This is a direct measure of the desired outcomes generated.
- **Overall CTR:** The overall CTR for May was **1.25%**, **higher than April's 1.00%**. This indicates the aggregate effectiveness of ad creatives and targeting.
- **Overall CPR:** The overall CPR in May was **109.09**, representing **worse** cost efficiency per desired action compared to April's **100.00**.
- **Overall ROI:** The overall ROI for May was **0.0091**, demonstrating **lower** profitability compared to April's **0.0100**.
    - **Key Takeaway:** The period from April to May witnessed a notable increase in reach (Impressions) and engagement (Clicks). However, a slight dip in overall ROI and an increase in CPR suggest that while volume increased, the conversion efficiency per unit of spend may have marginally lagged, warranting further investigation into the quality of results or cost per acquisition.

4.2. Performance by Audience Segment (May 2025)

Understanding how different audience segments respond to campaigns is critical for optimized targeting.

- **Gender-Based ROI & Efficiency:**

Gender	AverageROI
Unknown	0.005212
All	0.001056
male	0.001050
female	0.001030

    - **Finding:** The 'Unknown' gender category yielded the highest average ROI (**0.005212**), indicating a highly efficient segment. This suggests that campaigns reaching this undefined audience are particularly effective. Male segments demonstrated an average ROI of (**0.001050**), marginally higher than female segments at (**0.001030**).
    - **Recommendation:**
        - **Investigate 'Unknown' Gender:** Prioritize efforts to understand the characteristics and targeting behind campaigns contributing to the 'Unknown' gender segment's high ROI. If identifiable, replicate successful strategies to explicitly target similar high-value audiences.
        - **Optimize Gender Targeting:** Review and refine ad creatives, messaging, and placement strategies specifically for female target audiences to improve engagement and conversion efficiency. Consider A/B testing variations tailored to improve ROI within this segment, or strategically reallocate budget to higher-performing segments if improvements are not feasible.
- **Age Group Performance & Targeting:**

Age Group	AverageROI
45-54	0.001178
25-34	0.001117
All	0.001088
55-64	0.001028
65+	0.000986
35-44	0.000948

- **Finding:** Age groups **45-54 (0.001178)** and **25-34 (0.001117)** demonstrated the highest average ROI, indicating they are the most receptive and profitable demographics for the current campaign strategies. Conversely, the 35-44 age group showed a comparatively lower ROI (**0.000948**).
- **Recommendation:**
  - **Prioritize High-ROI Age Groups:** Increase focus and allocate additional budget towards the 45-54 and 25-34 age demographics, capitalizing on their proven efficiency and higher return potential.
  - **Re-evaluate 35-44 Segment:** Conduct a detailed analysis of campaign elements (creatives, offers, channels) specifically targeted at the 35-44 age group. Consider A/B testing different approaches to improve their ROI or strategically adjust budget if efficiency does not improve over time.

4.3. Campaign-Specific Performance & Cost-Effectiveness

Analyzing individual campaign performance is key to identifying which initiatives are most impactful.

- **Top Performing Campaigns (by ROI):**

Campaign name	Average ROI
Eldeco LVB Generic 18 March	0.002517
Eldeco LVB 10 March	0.001561
Eldeco LVB SITE Event 7 June	0.001362
Eldeco LVB 25 March MPF Page	0.001087
Eldeco LVB 24 Feb	0.000000
Eldeco LVB Dubai/Singapore NRI	0.000000

- **Finding:** "Eldeco LVB Generic 18 March" (**0.002517**) and "Eldeco LVB 10 March" (**0.001561**) emerged as the top two campaigns in terms of average ROI. These campaigns effectively translated ad spend into desired results.
- **Recommendation:**
  - **Replicate Success:** Conduct an in-depth review of the creative assets, targeting parameters, and bidding strategies employed by these high-performing campaigns. Extract best practices and apply them as benchmarks for underperforming or new campaigns.
  - **Allocate More Budget:** Strategically increase budget allocation to these proven campaigns to scale their success, continuously monitoring to ensure efficiency is maintained at higher spend levels.

- **Campaigns with High CTR (Engagement):**

Campaign name	AverageCTR (May'2025)
Eldeco LVB 25 March MPF Page	1.57
Eldeco LVB 10 March	0.51
Eldeco LVB Generic 18 March	0.47
Eldeco LVB SITE Event 7 June	0.33
Eldeco LVB 24 Feb	N/A

    - **Finding:** "Eldeco LVB 25 March MPF Page" exhibited an exceptionally high CTR (**1.57**), significantly outperforming other campaigns in engagement. This indicates strong ad creative and messaging resonance with its audience.
    - **Recommendation:**
        - **Creative Analysis:** Analyze the ad copy, visuals, and calls-to-action used in "Eldeco LVB 25 March MPF Page" to understand the elements that drove high engagement. Implement similar creative principles in other campaigns to boost their respective CTRs and overall click performance.
- **Underperforming Campaigns / Areas for Cost Cutting:**
    - **Finding:** Campaigns such as "Eldeco LVB 24 Feb" and "Eldeco LVB Dubai/Singapore NRI" registered an ROI of **0.000000**, indicating no results were generated for the associated expenditure during the reporting period. The analysis also revealed segments with high CPR for 'Unknown' Result Types (**88.223005**), while other Result Types (Engagement, Reach, etc.) also showed 0 ROI, indicating no associated cost or results.
    - **Recommendation:**
        - **Immediate Review & Pause/Optimize:** Conduct an immediate and thorough review of campaigns with zero ROI. If these campaigns consistently fail to generate results, consider pausing them to prevent further inefficient spend. For strategic campaigns that are underperforming, a comprehensive overhaul of targeting, creative, and bidding strategies is imperative.
        - **Identify High CPR Segments:** Systematically identify and analyze campaigns or segments exhibiting unusually high CPR. Reassess their value proposition, re-evaluate their necessity, or cease investment in areas where efficiency is consistently poor. Focus should be on optimizing Result Types with a high CPR to reduce conversion costs.

4.4. Future Cost Cutting & Optimization Strategies

- **Recommendation:**
    - **Dynamic Budget Allocation:** Implement a robust framework for dynamic budget allocation based on real-time performance data. Prioritize investment towards campaigns and audience segments that consistently demonstrate the highest ROI and lowest CPR. This agile approach ensures resources are continuously channeled to the most profitable areas.
    - **Negative Targeting Refinement:** Continuously update and refine negative keyword lists and audience exclusion parameters. This proactive measure prevents ads from being served to irrelevant or non-converting audiences, thereby significantly reducing wasted impressions and clicks.

- **Automated Bidding Strategies:** Explore and rigorously test advanced automated bidding strategies (e.g., target CPA, maximize conversions). These strategies, where supported by the advertising platform, can optimize spend directly towards desired results rather than mere impressions or clicks, leading to improved cost efficiency.
- **Funnel Optimization:** Conduct a holistic analysis of the entire user journey, from initial ad impression to the final desired result. Identify and address any observed drop-off points (e.g., high bounce rates on landing pages, complex conversion forms). Improving post-click experience and overall funnel efficiency can substantially enhance ROI without increasing ad spend.
- **Experimentation (A/B Testing):** Implement a systematic A/B testing methodology for various campaign elements, including ad creatives, copy variations, landing page designs, and targeting parameters. The insights derived from these experiments should be used to iteratively optimize campaigns, ensuring continuous improvement and reduction of inefficient spending.

5. Conclusion

This report provides a data-driven overview of digital marketing campaign performance from April to May 2025. By systematically collecting, cleaning, analyzing, and visualizing the data, key insights into campaign effectiveness, audience performance, and ROI drivers have been identified. The actionable recommendations aim to guide future marketing efforts towards increased efficiency, profitability, and overall success, with a strong emphasis on optimizing spend and achieving better results. Continuous monitoring and iterative optimization, guided by these insights, will be crucial for sustained improvements in campaign performance and overall marketing ROI.

Appendix: Workspace Details

For technical details on the project setup, features, and how to replicate the analysis, please refer to the `README.md` file in the project repository. It contains instructions on installing dependencies and running the `main.ipynb` notebook.