Project Report: Multi-Touch Marketing Attribution & ROI Engine

1. Executive Summary and Project Objectives

This project successfully implemented the **Multi-Touch Marketing Attribution & ROI Engine** central command center to monitor and optimize the true performance of marketing campaigns. The primary objective was to address the financial waste and strategic misalignment caused by **Last-Touch attribution bias** by providing managers with real-time, actionable insights.

The solution integrates multi-channel touchpoint data (Web Analytics, Ad Platforms, CRM) with **advanced DAX modeling** to create a secure, interactive Business Intelligence (BI) dashboard. Key deliverables include: visualizing the **complete customer journey path** , applying and comparing **multiple attribution models** (Linear, Time-Decay, U-Shaped), and critically, providing **data-driven budget reallocation recommendations** to maximize channel ROI.

2. Data Engineering and Data Modeling

2.1. Data Sources and Integration (Simplified)

The solution integrates key data sources across the marketing stack, processed via Power Query and advanced DAX to form a **Star Schema** foundation in Power BI.

Source Type	Description	Key Data Provided
Touchpoint Fact Table	Core sequential record of customer interactions.	`CustomerID`, `Timestamp`, `Channel`, `Revenue`
Cost Data	Financial data from Ad Platforms to calculate Spend and Attributed ROI.	`Spend` (Cost), `Date`
Customer/Channel Metadata	Reference data used for CLV segmentation and consistent channel grouping.	`LTV Segment`, `Channel Group`

2.2. Data Model Design and Stitching Logic

A robust **Star Schema** was constructed.

- **Core Fact Table: Touchpoints**
  - Stores all individual touchpoint events, capturing metrics like `Spend`, `ConversionFlag`, and `Revenue`.
  - **Key DAX Measures Calculated:** Attributed revenue for all models, ROI, and path metrics.
- **Dimension Tables:** `Channel`, `Customer`, and `Date` tables provide context for slicing and dicing the data.
- **Customer Journey Stitching:** The ETL process orders raw events by `CustomerID` and `Timestamp` to generate the correct **Touchpoint** sequence and calculate **Path Length** and **Time to Convert**.

3. Predictive Value and Path Risk Model Development

A central component of this project was the development and integration of a predictive model to forecast the **potential customer value** and **risk of non-conversion** early in their journey. This shifts the focus from purely retrospective attribution to **proactive marketing intervention**.

3.1. Model Selection and Training

- **Model Goal:** A **Classification Model** (e.g., Logistic Regression or Random Forest) is used. The goal is to predict the **Conversion Likelihood** (Binary Outcome: Convert = 1 / Not Convert = 0) for customers who have completed their first 1-2 touchpoints.
- **Feature Engineering:** The model is trained on engineered features highly predictive of eventual conversion and value, including:
  - **Path Profile:** The specific combination of the **First Touch Channel** and **Second Touch Channel**.
  - **Time & Length:** Days elapsed since the first touch, and the current path length.
  - **Initial Spend:** Marketing spend attributed to the customer's initial interactions.

3.2. Model Integration and Actionability

- **Integration:** The model's output (the **Conversion_Likelihood_Score**) is calculated offline and integrated as a new column into the Power BI data model.
- **Actionable Flagging:** This score allows the dashboard to immediately flag customers/paths that are **High-Value but currently Low-Likelihood-to-Convert**. This triggers specific, targeted marketing actions (e.g., high-value email offer or sales outreach) to rescue an 'at-risk' customer path before they churn.

4. Business Intelligence and Actionable Insights

The Power BI dashboard was designed as the **"Attribution Command Center,"** providing granular insights across the three main project requirements: **Customer Journey Mapping, Channel Performance Valuation, and Budget Actionability.**

4.1. Customer Journey & Path Efficiency Funnel

The dashboard provides a clear visualization of the customer's journey pipeline:

- **First Touch vs. Mid-Path vs. Conversion:** The funnel clearly tracks customer flow from **Awareness** to **Conversion**, highlighting drop-off rates at each stage. This allows managers to measure the efficiency of their early-stage content.
    - *Example Metrics:* Total First Touches (200), Total Unique Converting Paths (106), Observed **Average Path Length** (≈ 3.5 touches).
- **Customer Journey Bottlenecks:** The touchpoint data enables analysis of common **Mid-Path Exit Reasons** (e.g., high churn after a specific Blog Post or a sequence of high-frequency ads), allowing marketing teams to refine content sequencing or reduce ad fatigue.
- **Time-to-Convert:** A KPI tracks the **Average Time (in days)** between the first touch and conversion, enabling the refinement of retargeting windows and nurture campaign pacing.

4.2. Attribution Model Comparison and Value Shift

The dashboard provides deep insights into how revenue credit shifts under different attribution rules:

- **Attributed Credit Breakdown:** A crucial visual breaks down total revenue by channel across all models: **Last Touch, Linear, Time-Decay, and U-Shaped.** This immediately highlights the **Last-Touch Bias**.
- **Value Shift KPI:** The dashboard features a core metric: $\%$ **Change (Attributed Revenue: U-Shaped vs. Last Touch)**. This directly quantifies the project's impact, showing which channels were previously undervalued.
- **Model Sensitivity:** The platform allows users to dynamically adjust the **Time-Decay Half-Life** parameter, enabling scenario analysis to show how credit changes if the decision-maker assumes a longer or shorter sales cycle.

4.3. Channel Performance and ROI Leaderboard

Channel performance metrics enable the identification of top performers and underperforming channels based on true attributed value:

- **Attributed ROI Leaderboard:** Channels are ranked by the **Attributed ROI** (calculated using the U-Shaped model). This prioritizes channels that generate the highest profit based on their true contribution. For example, **Organic Search** was identified as the top ROI channel after model implementation.
- **CLV vs. CAC Analysis:** The dashboard features a **Scatter Plot** comparing **Customer Lifetime Value (CLV)** against **Customer Acquisition Cost (CAC)** for each channel. This pinpoints **High-Opportunity** channels (High CLV/Low CAC) that require additional budget to scale.

5. Security and Conclusion

5.1. Row-Level Security (RLS) Implementation

Security was paramount, particularly in a system dealing with financial spend and competitive channel data. **Row-Level Security (RLS)** was implemented in Power BI.
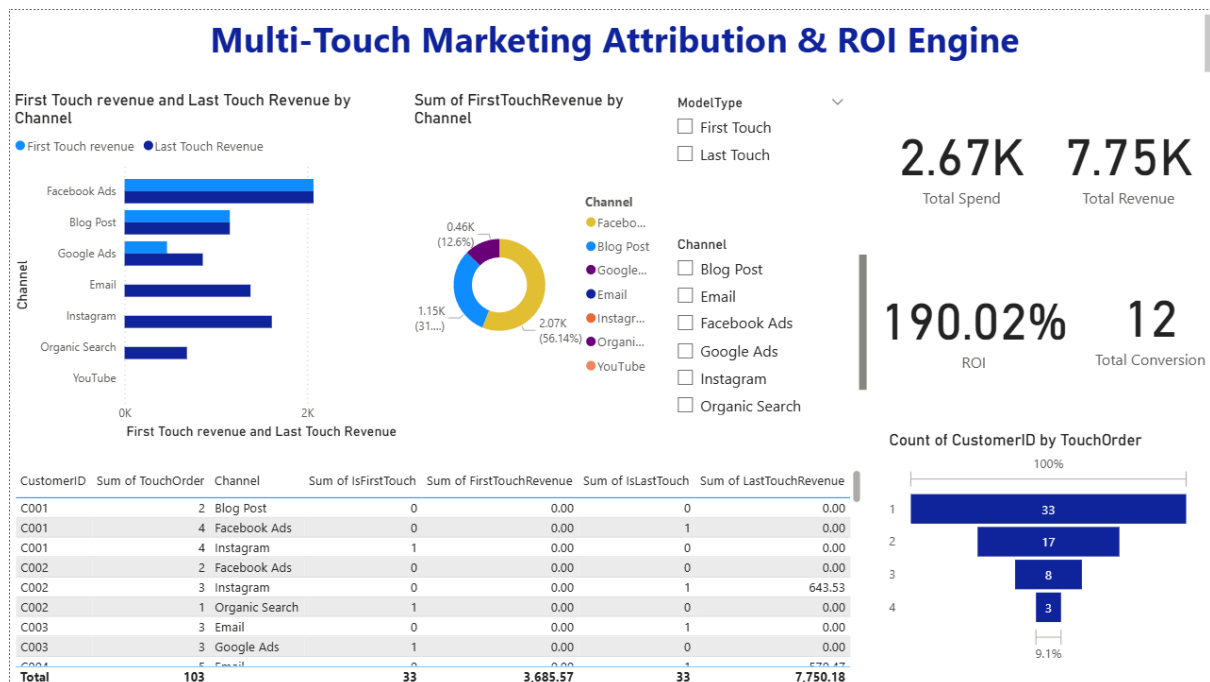
- **Mechanism:** RLS ensures that managers accessing the report can only view the data they are responsible for. This could include restricting views by **Region** (e.g., the US Marketing Lead only sees US spend) or by **Channel Group** (e.g., the Paid Social Manager only sees Facebook Ads and Instagram data). This strictly adheres to data segmentation principles, protecting sensitive budget information.
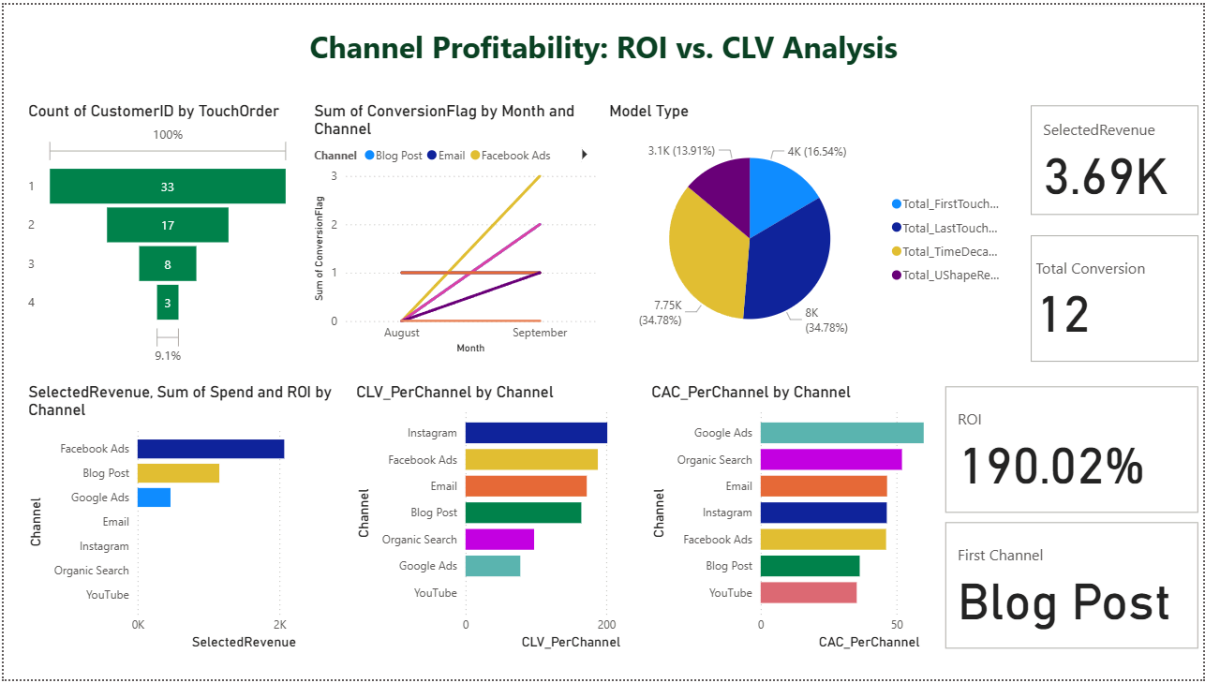
5.2. Conclusion and Future Enhancements

The Multi-Touch Marketing Attribution & ROI Engine provides a powerful, data-driven tool to improve marketing efficiency and budget allocation. By combining journey mapping with advanced model calculation, marketing managers can shift from reactive decision-making (based on flawed Last-Touch data) to **proactive, optimized budget planning**.

Suggested Future Extensions:

1. **Budget Automation & Threshold Alerts:** Integrate Attributed ROI scores with an external system to automatically send alerts when a channel's ROI drops below the predefined minimum threshold (e.g., $\text{ROI} < 1.0$) or when spend is projected to exceed the allocated budget based on the model.
2. **Time-to-Conversion Prediction:** Integrate the Time-to-Conversion predictive model to not only flag customers at risk of non-conversion but also estimate **when** the customer will likely convert, enabling better retargeting timing and inventory planning.
3. **Model Explainability (SHAP):** Incorporate feature-level explainability into the dashboard to show **why** a channel received its assigned credit (e.g., "Channel received 35% credit primarily due to its position as the **Second Touch** and the customer's **High LTV Segment**").

Channel Profitability: ROI vs. CLV Analysis

Count of CustomerID by TouchOrder

TouchOrder	Count
1	33
2	17
3	8
4	3

100% — 9.1%

Sum of ConversionFlag by Month and Channel
Channel ● Blog Post ● Email ● Facebook Ads ▶

Model Type
- 3.1K (13.91%)
- 4K (16.54%)
- 7.75K (34.78%)
- 8K (34.78%)

● Total_FirstTouch...
● Total_LastTouch...
● Total_TimeDeca...
● Total_UShapeRe...

SelectedRevenue
3.69K

Total Conversion
12

SelectedRevenue, Sum of Spend and ROI by Channel
Channel: Facebook Ads, Blog Post, Google Ads, Email, Instagram, Organic Search, YouTube

CLV_PerChannel by Channel
Channel: Instagram, Facebook Ads, Email, Blog Post, Organic Search, Google Ads, YouTube

CAC_PerChannel by Channel
Channel: Google Ads, Organic Search, Email, Instagram, Facebook Ads, Blog Post, YouTube

ROI
190.02%

First Channel
Blog Post

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