

Marketing Mix Modeling



Perceptive**Analytics**

cs@perceptive-analytics.com | 646 583 0001

A silhouette of a man in a suit is shown from behind, looking out a window with horizontal blinds. The scene is dimly lit, with light filtering through the blinds, creating a contemplative atmosphere.

Executive Summary

World is shifting into digital platforms...

Most consumer and business purchases happen after multiple touchpoints with various factors affecting the decision. Marketing data can be mined to reveal the decision making patterns through marketing mix modeling.

MMM can help you answer the following questions

What impact do each of my campaigns have?
What is the cost per conversion and ROI? What should I do to maximize my revenue and profits?

[Read More...](#)



Strategic Importance

Why do you need MMM?

Calculates ROI on Marketing

Reflects upon past marketing decisions by calculating ROI

Explains Performance Change

Diagnoses the reasons for the change in business performance by considering the impact of different internal (Advertising, Media selection, Trade promotion, etc.) and external factors (Pricing, Seasonality, Trends, etc.)

[Read More...](#)



Understanding MMM

MMM is the use of statistical and analytical tools to quantify the impact of past marketing decisions and predict future sales impact for different marketing spend scenarios. It quantifies the impact of individual marketing activities on revenues, volume and price perception.

How does it work?

MMM is basically a combination of Attribution modeling & optimization, put together.

MMMs can be built using Linear/Non-linear Regression methods, Influence maximization approach, Agent based approach or Empirical methods.

[Read More...](#)



Attribution Modeling

Attribution models attribute past sales/conversions to different marketing channels, campaigns and resources used. These models range from single factor models to advanced models with varying levels of complexity.

[Read More...](#)

Optimization

Optimization models then use the results from Attribution modeling to find: The optimum marketing budget needed to attain a given amount of sales (or) The optimum marketing mix for a given marketing budget

Types of MMM

Regression techniques are the oldest to have been used for MMM. We can construct a regression equation that considers proportion of investments in different marketing channels and develop an algorithm to maximize revenues.

[Read More...](#)

Key Success Factors

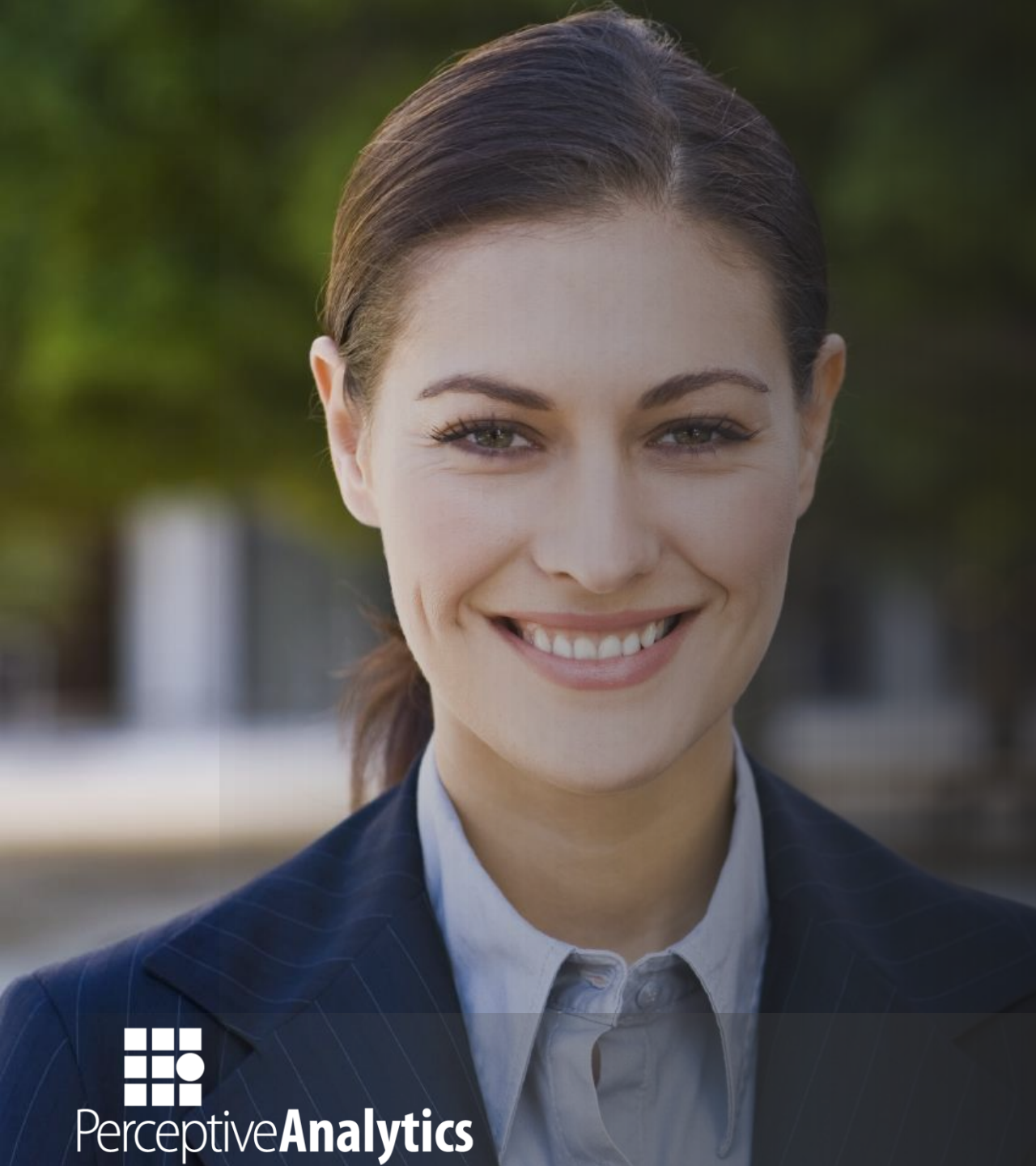
For Implementation of Market Mix Modeling

Availability of Data

Success of MMM efforts depends largely on availability of sufficient and accurate data.

Internal Alignment

Model's data architecture should be compatible with organization's IT architecture and aligned with company's internal processes.



Perceptive Analytics is a Data Analytics Company recognized as a Top 10 Emerging Analytics Company and as a '20 Most Promising Data Analytics Solution Provider' company.

The clients we served include Morgan Stanley, Amex, Wells Fargo, PepsiCo to name a few. We work with clients as their analytics department or alongside internal teams to deliver long-term competitive advantage.

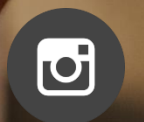
- Marketing Analytics
- Customer Analytics
- Marketing Mix Modeling
- Churn Modeling
- Up-sell Cross-sell analytics

To know how we can help you, you can set up a free call.

[Schedule Free Consulting Call](#)

Chaitanya Sagar, CEO
cs@perceptive-analytics.com
646.583.0001

Optimizing Marketing Spend with Marketing Mix Model [Expanded Version]



[Marketing Analytics](#) | [Tableau Consulting](#) | [Excel Apps](#)
New York • Dallas • San Francisco • Hyderabad
Perceptive-Analytics.com
(646) 583 0001 cs@perceptive-analytics.com

Optimizing Marketing Spend with Marketing Mix Model

Executive Summary

Companies face the challenge of allocating their fixed marketing budget among various marketing channels. Marketing Mix Modeling (MMM) can measure the impact of your marketing investments on sales and optimize your marketing spend.

Most purchases are affected by online and offline factors. Digital platforms like Google, YouTube, Instagram, Twitter, Facebook, Internet display ads, brand's website etc. can not only deliver targeted content to the right consumers, but also rapidly measure their response and give us detailed data to the last level of customer interaction. This data can be mined to understand how each key word/campaign/media contributes to your sales and unravel purchase behavior. Some questions MMM can help you answer are:

- What impact do my campaigns have on revenue and profitability?
- What impact do my digital campaigns have, combined with other media campaigns?

In this case study, we focus on Non-linear regression models and Relative Importance methods to quantify media effectiveness and optimize your marketing spend across digital and other media.

What is Marketing Mix Modeling?

MMM is the use of statistical and analytical tools to quantify the impact of past marketing decisions and predict future sales impact for different marketing spend scenarios. MMM quantifies the impact of individual marketing activities on revenues, volume and price perception.

Strategic Importance of Market Mix Modeling

- Reflects upon past marketing decisions by calculating ROMI
- Quantifies impact of marketing variables on base & incremental revenue
- Distinguishes the reasons for the change in business performance by considering the impact of different internal (Advertising, Media selection, Trade promotion, etc.) and external factors (Pricing, Seasonality, Trends, etc.)
- Enables 'What-If' analysis to apprise you on the possible results of marketing budget reallocation scenarios
- Optimizes marketing spend by maximizing ROMI
- Helps understand the short term Vs. long term impact of marketing activities

Attribution Modeling & Optimization

MMM is basically a combination of Attribution modeling & optimization, put together.

- Attribution models attribute past sales / conversions to different marketing channels, campaigns and resources used. These models range from single factor models to advanced models with varying levels of complexity.
- Optimization models then use the results from Attribution modeling to find:
 - the optimum marketing budget needed to attain a given amount of sales (or)
 - the optimum marketing mix for a given marketing budget

Types of Market Mix Modeling

MMMs can be built using Linear/Non-linear Regression methods, Influence maximization approach, Agent based approach or Empirical methods.

Regression techniques are the oldest to have been used for MMM. We can construct a regression equation that considers proportion of investments in different marketing channels and develop an algorithm to maximize revenues. Here, we focus particularly on Non-linear regression models for MMM.

Non-linear regression models can manage increased complexity of marketing variables by fitting a flexible spline to data, instead of a straight line. This gives more flexibility to incorporate as well as capture complex aspects like interactions/synergies within and between media groups, carryover effects of advertising, diminishing returns of media (described by an S-shaped curve), etc.

Non-linear Regression Models for Attribution & Optimization

Let's consider the following: Google (G) and Facebook (F) in Digital media (DM) group; TV (T) in Offline media group. Eqn.1 calculates the impact of each individual media inside the digital group (Google & Facebook) and the synergy within digital media group. Eqn.2 calculates the impact of each media group (Digital and Offline) and synergy between media groups (aka higher order interactions). Together, these two equations form the hierarchical model.

$$DM_t = \beta_0 + \beta_1 * G_t + \beta_2 * F_t + \beta_3 * G_t * F_t$$

(Eqn.1)

$$Sales(G_t, F_t, T_t) = \alpha_0 + \alpha_1 * DM_t + \alpha_2 * T_t + \alpha_3 * DM_t * T_t + \epsilon_t$$

(Eqn.2)

Where, DM_t is the digital media factor,
 β_3 captures the synergy within digital media (Google and Facebook),
 α_3 captures the synergy between digital and offline media.

If MMM shows synergies within or between media groups, then managers can benefit by increasing the total media budget and allocating more than fair share to the less effective medium, because it helps increase the effectiveness of the another more effective medium!

The optimal spending to maximize profit (consequently, ROMI) can be derived to be:

$$G^* = m * (\alpha_1 + \alpha_3 * \ln(T^*)) * (\beta_1 + \beta_3 * \ln(F^*))$$

(Eqn.3)

$$F^* = m * (\alpha_1 + \alpha_3 * \ln(T^*)) * (\beta_2 + \beta_3 * \ln(G^*))$$

(Eqn.4)

$$T^* = m * (\alpha_2 + \alpha_3 * \ln(DM))$$

(Eqn.5)

Where, G^* , F^* & T^* are the optimal spending for Google ads, Facebook & TV respectively.

Using Relative Importance methods for attribution

Relative Importance methods calculate contribution of different medias to sales by decomposing Regression R^2 . Here, R^2 represents the portion of variance in Sales that can be explained by a regression model with a subset of predictors. There are two types of Relative Importance methods:

- Dominance Analysis (DA) evaluates contribution of different media by comparing R^2 of all nested sub-models composed of independent predictors with the R^2 of the full model. If R^2 from models involving one media is always higher than R^2 from models involving another media, then the former is completely dominant over the latter.

The drawback of Dominant analysis is that when the number of media increases, the computations grow exponentially as more number of sub models must be built for analysis. But, it can handle more observations easily.

- Relative Weight Analysis (RWA) creates a new set of orthogonal variables (some linear combination of your spend in each media) using eigen vectors, to eliminate the intercorrelations. Thereby, the coefficients of regression of these orthogonal variables can be directly interpreted as their contribution to sales. As these orthogonal variables are a linear combination of your spend in different media, their coefficients can be decomposed to get the contribution of individual media to your sales.

Relative Weight Analysis can work better with more number of medias but takes time when more observations are present. Both the methods give very similar results. So, one can choose a method based on the size and structure of data.

Key factors for successful implementation of Market Mix Modeling

The data used in MMM can be ad spends, promotion details, pricing, distribution, competing brand details, competitor ad spend, industry data and economic data. Success of MMM efforts depends largely on availability of sufficient and accurate data. Data must be granular both in terms of classification and reporting frequency (weekly vs. monthly data).

Also, model's data architecture should be compatible with organization's IT architecture and aligned with company's internal processes. Other factors include a cross functional team to ensure integrity of data, flexibility to add new media channels as they emerge and the ability to deliver key insights at the right time to the right people.

References

1. [Measuring effectiveness of Online advertising, Study conducted by PwC](#)
2. [Revenue based attribution modeling for Online advertising](#)
3. [A Hierarchical Marketing Communication Model of Online and Offline Media Synergies](#)

Conclusion

Using MMM, you can convert your data on impressions, clicks, conversions, etc. into actionable recommendations: how much to spend on marketing advertisements, how much to spend on which media, etc. which you can use to support your marketing decisions and protecting defending marketing budgets, getting the budget approved, doing the right investments and maximizing return on marketing investments.

About Us

Perceptive Analytics is a Data Analytics Company recognized as a Top 10 Emerging Analytics Company and as a '20 Most Promising Data Analytics Solution Provider' company.

The clients we served include Morgan Stanley, Amex, Wells Fargo, PepsiCo to name a few. We work with clients as their analytics department or alongside internal teams to deliver long-term competitive advantage.

- Marketing Analytics
- Customer Analytics
- Marketing Mix Modeling
- Churn Modeling
- Up-sell Cross-sell analytics

To know how we can help you, you can set up a free call.

[Schedule Free Consulting Call](#)



Contact

Chaitanya Sagar, CEO
cs@perceptive-analytics.com
646.583.0001