

AI Marketing Transformation

Best Practices to implement a successful
Marketing Mix Modeling process

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AI Marketing transformation

Best Practices to implement a successful Marketing Mix Modeling process

We are witnessing and participating in a new era of marketing measurement effectiveness. Recent ecosystem changes are driving the community to rapidly advance in a field that had lagged over the past decade. However, in the last four to five years, we have observed remarkable progress, mainly thanks to innovations from the open-source community and the adoption of Artificial Intelligence into our everyday life.

As we discovered in our previous Paper: “The opportunities Behind Open-Source Techniques”¹: The migration from licensed-software to open-source solutions is gaining momentum. A true reflection of this trend is patent in the evolution of searches related to “MMM”, with an increase of 32% in 2023 compared to 2022, continuing with a positive trend in 2024².

Together with this, businesses operate within a **rapidly evolving marketing landscape**

where new technologies are reshaping the way advertising space is optimized. New channels are disrupting the market, with social commerce and live streaming providing new opportunities for companies to engage with their audiences in real time and maximize the return of their advertising investments.

As a result, we are observing a significant trend where companies are progressively refining their approaches to measure marketing effectiveness, transitioning towards more agile methodologies that emphasize actionable insights. **Within this evolving landscape, the positioning of each company in the realm of MMM implementation is unique,** as each business’s specific requirements are influenced by multiple dimensions.

These factors are illustrated in our positioning framework, that not only captures the current landscape but also provides insights into how organizations can adapt to these ongoing changes.

[1] Marketing Mix Model. The Opportunities Behind Open-Source Techniques | Deloitte España.

[2] Google Trends. (2023/2024). Trend data for Marketing Mix Modelling. Retrieved November 22, 2023 / June 1, 2024.

If you are navigating the process to internalize the “Marketing Mix Modelling”, **this paper serves as a strategic guide for marketing stakeholders and data science teams,** aiming to translate insights into actionable strategies that will foster significant organizational transformation



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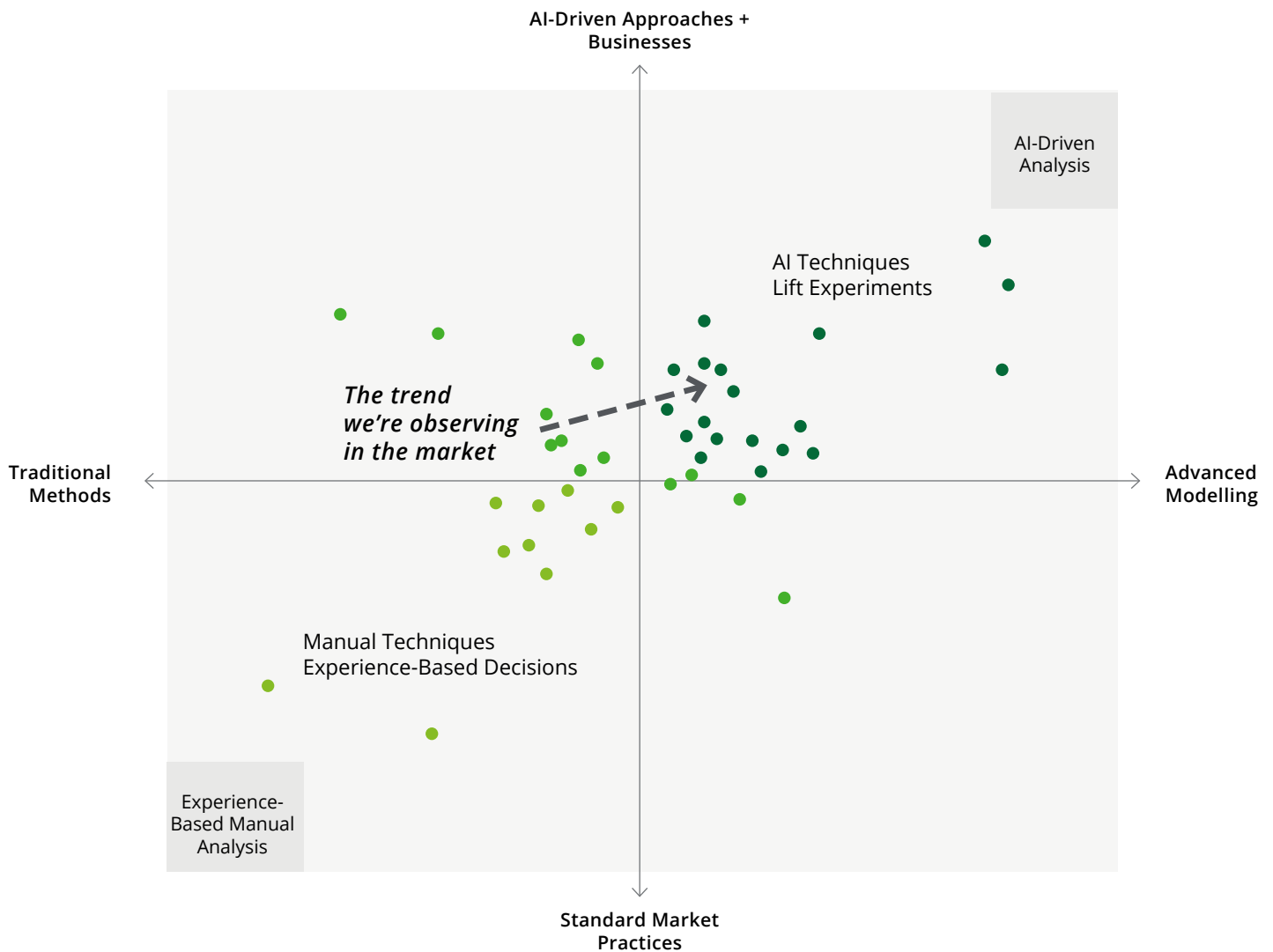


Chart1: Positioning Framework.

If you are navigating the process to internalize the “Marketing Mix Modelling”, this paper serves as a strategic guide for marketing stakeholders and data science teams, aiming to translate insights into actionable strategies that will foster significant organizational transformation.

We will highlight the key factors for a successful process, covering data considerations, model selection, integrating business acumen, and developing an ongoing, adaptive process.

Choosing your toolkit in AI-Driven Marketing



Ensuring that the marketing mix system is well-aligned with the unique needs and goals of the business is crucial to effectively internalize the process. It must start by clearly defining objectives and key questions to address.

This involves **assessing the specific characteristics of the marketing expenditures** to address different areas of analysis, considering data granularity, effective data cleaning techniques, geographic analysis, and the integration of various data types, including both online and offline, as well as paid and non-paid sources. Before initiating the process, consider the following:

The diverse factors that influence the business.

What level of detail is required for an actionable understanding of the business context and status?

Should the information be split by region, category, product type, channel sales, customer segment, or any other variable?

The marketing activities are differentiated by the levels in the decision-making process of the company:

What is the ROAS for a full-funnel campaign?

What is the incremental effect of each marketing channel?

The data considered for the MMM extend beyond marketing spend to include integration of external sources

such as macroeconomic variables, market trends, and seasonal changes. To select these variables, it is essential to identify all factors that could impact sales.

Other key factors might include:

Does the market exhibit strong seasonality?

How are brand building investments affecting sales in the longer term?

Is there a possible halo effect from marketing efforts on different product lines?

Depending on the industry, the types of variables introduced in an MMM will vary. However, as a general guideline, the following modelling scheme provides a broad and non-exhaustive example from the retail industry. It outlines the necessary considerations for effective marketing mix modelling, combining an ecosystem of analysis that aligns brand and sales objectives.

MMM: Input Modelling scheme



Chart2: Modelling Scheme.

Understanding the objectives of MMM guides the selection of the most suitable methodologies. By comprehensively assessing

the complexity and requirements of the analysis, the most effective approach can be chosen from those described in the next chart:

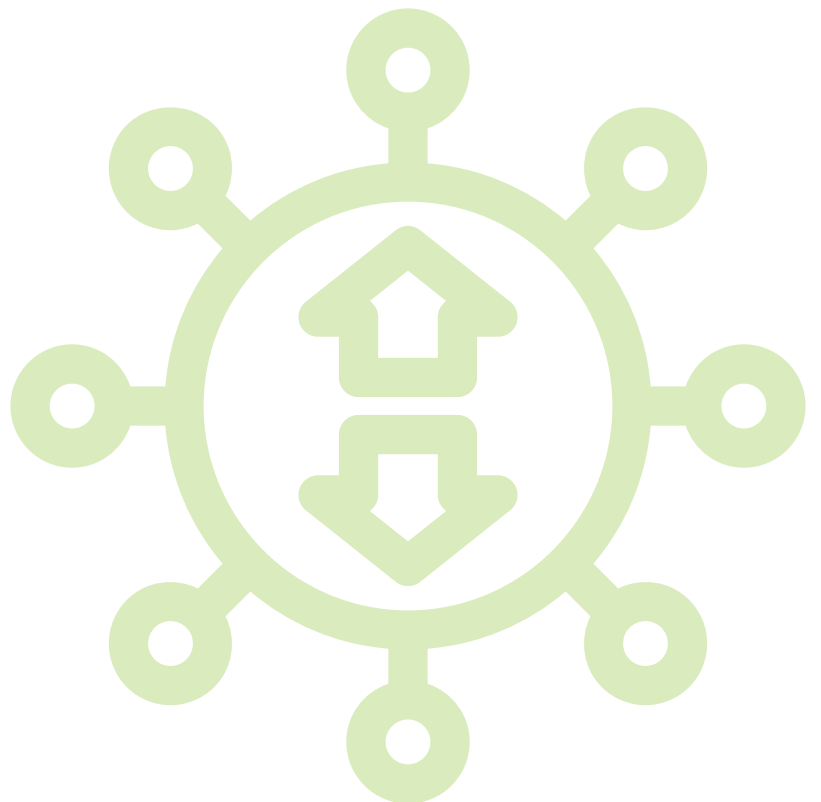
Establishing Scope: Choosing your Toolkit to Meet Strategic Needs

TRADITIONAL MODELLING

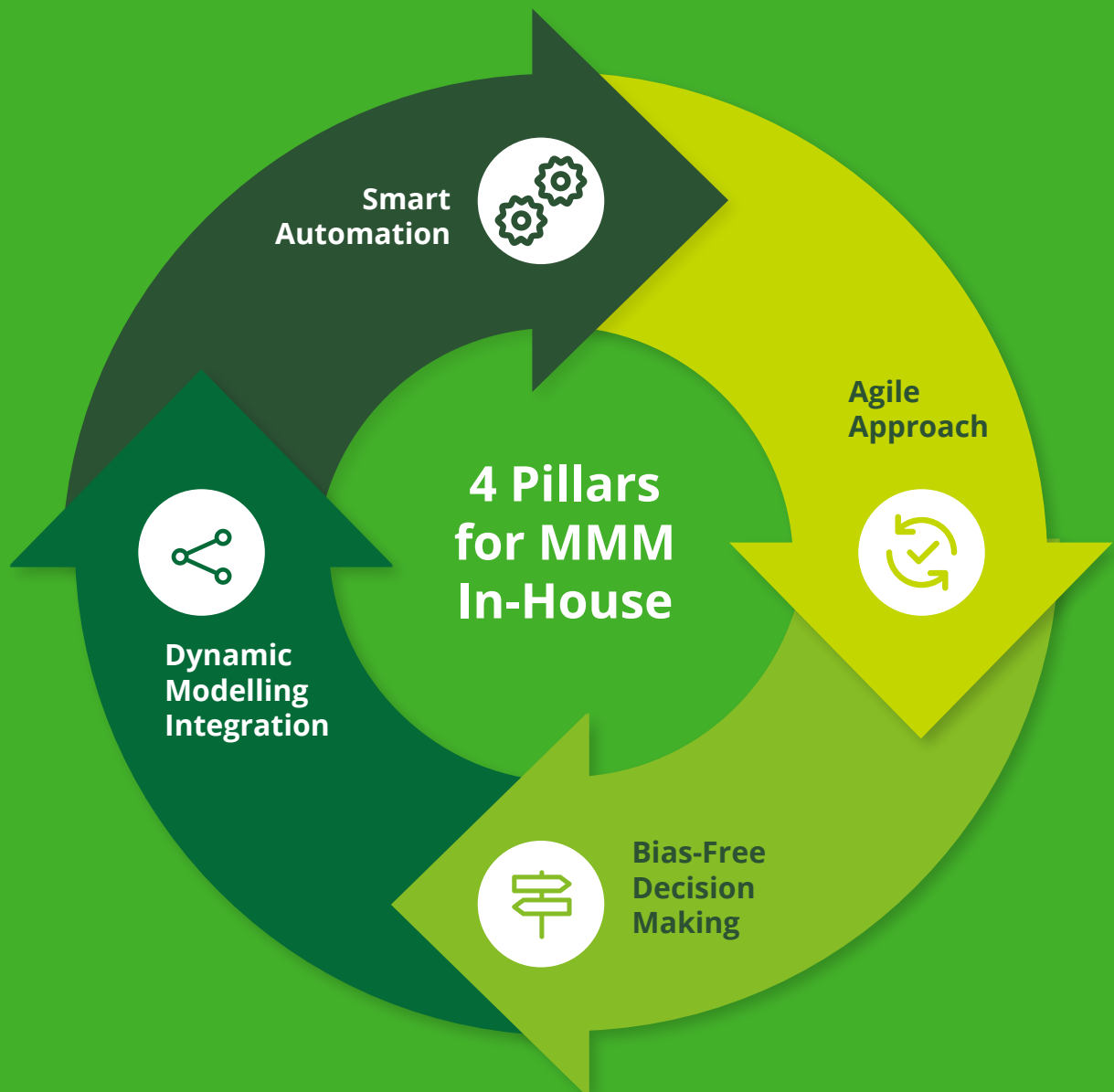
ADVANCED MODELLING

	Linear Regression Model	Bayesian Structural Time Series (BSTS)	Bayesian Linear Model with carryover and shape effects	Robyn (+ Prophet)
How adaptable is it to shifts in data trends?	Adapts primarily through manual inclusion of additional variables and interaction terms to differentiate between media, non-media, and contextual influences	Inherently includes time-based patterns like seasonality and special events, while requiring manual customization to handle media variables and non-linear effects	Dynamically adapts to incorporate time-based patterns like seasonality and special events, while effectively managing media variables and non-linear effects	Handles in an automatized way different media variables and can integrate special events, seasonality, and other non-linear patterns
How are variables prioritized during analysis?	Sensitivity to noise with deep level data	Offers robustness in handling data with varying levels to adjust to data complexity and minimize overfitting	Offers robustness in handling data with varying levels to adjust to data complexity and minimize overfitting	Can handle deep-level data by leveraging Ridge regression, optimizing feature selection using evolutionary algorithms, and ensuring model stability
How is multilevel analysis integrated?	Requires manual configuration for hierarchies	Inherently flexible for hierarchical modeling	Inherently flexible for hierarchical modeling	Non-Automated hierarchical modeling
How reliable are the results in capturing the true value of marketing?	Indirect, relying on variable selection, dummy variables, and coefficient constraints	Can optimize parameters based on priors, particularly for adjusting to time series data like seasonality and events	Can optimize parameters based on priors, with a focus on long-term effects in media variables	Enables the direct inclusion of experiments results into the models allowing a seamless calibration
How is business acumen integrated?	Indirect, enables the incorporation of business insights through variable selection	Ability to incorporate business knowledge through priors to adapt to changes in timing and events	Ability to incorporate business knowledge through priors to model long-term media effects accurately	Automated integration of strategic business insights through DECOMP.RSSD and model calibration
How fast is the decision-making process?	Requires manual intervention to adapt to shifts in data trends	Adapts to shifts in data trends through continuous updating of priors and model parameters	Adapts to shifts in data trends through continuous updating of priors and model parameters	Allowing continuous updates with the refresh capability
How actionable is decision-making?	Manual adjustments enable precise 'what if' scenario planning	Facilitates dynamic, data-driven scenario planning	Enhances predictive scenario simulations	Integrated budget allocator to immediate what-if scenario analysis

Data meets model



Once we have a clear goal to achieve with the MMM process, it is imperative to design a comprehensive data strategy that follow the 4 pillars to develop a smooth process:



The four pillars operate in a circular, interconnected manner, each complementing the others without a fixed sequence.



Dynamic Modelling Integration

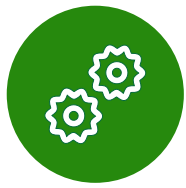
First, the Dynamic Modelling Integration will be discussed: to focus on effective and adaptable measurement.

To provide a holistic view of marketing performance, it is critical to consolidate disparate data sources into a single analytical framework that collects data at different levels of granularity across channels. In this context, it is crucial to have a flexible framework that can quickly adapt to changing market dynamics allowing for the inclusion of additional variables and updates.

This requirement presents the challenge of successfully managing the trade-off between detail and accuracy. Selecting effective

techniques is essential to capture key influences while remaining streamlined for interpretability ensuring balanced decision making.

As discussed in the 'Methodological Approaches Overview' chart, different methodologies handle variables in various ways. In this case, Robyn's positioning on the topic is noteworthy because it standardizes and optimizes various media variables in a customized manner. Additionally, it can integrate special events, seasonality, and other non-linear patterns. While other methods primarily adapt through the manual inclusion of additional variables and interaction terms, relying on the experience and skills of the analyst to select the correct variables and configure the model adequately.



Smart Automation

We will follow with Smart Automation: accessing ways to drive value through automated solutions.

MMM is a continuous process, that's why a key part is automation. By leveraging advancements in AI and machine learning algorithms, as well as incorporating cloud solutions, the modelling process becomes faster and more efficient, reducing by 40-50% the time dedicated to the modelling task, according to the Deloitte benchmark. The time when running one model took 5 hours or more is far behind, now it is possible to run thousands of iterations in minutes. We have cases where Bayesian models take only 10 minutes to run considering 50 models behind with a structural model.

Despite these advancements, challenges remain in AI adoption. According to Stanford's 2024 AI Index Report, 'AI enables workers to

complete tasks more quickly and to improve the quality of their output'³. However, barriers such as the complexity of AI systems and a lack of skilled personnel continue to prevent 40% of companies from embracing these automation processes⁴.

To date, thanks to the democratization of analytics, sophisticated and complex algorithms are now within reach, streamlining processes to save time and effort, providing an advantage in efficiency. Key areas benefiting from automation include data transformation and optimization. Examples of such automation through open-source tools are data normalization, time-series decomposition for trend and seasonality and hyperparameter optimization, enabling a full modelling cycle with 2.000 iterations within 30 minutes utilizing cloud computing.

[3] Stanford University. "Stanford's 2024 AI Index Report." Stanford Human-Centered Artificial Intelligence, 2024, <https://aiindex.stanford.edu/report/>.

[4] IBM. "IBM Global AI Adoption Index 2023." IBM Corporation, 2023, <https://www.multivu.com/players/English/9240059-ibm-2023-global-ai-adoption-index-report>.



Agile Approach

Next, adopt an Agile Approach by facilitating effective contributions from all key players in the marketing mix optimization, enhancing a smoother decision-making process. Equipping the business with the ability to quickly run multiple scenarios and simulations allows for timely adjustments in strategies, responding

to both anticipated and unexpected changes in the marketplace. To ensure scalability when developing an MMM in-house, it is crucial to select approaches that integrate continuous update capabilities and 'what-if' scenario simulation tools into their models.



Bias-Free Decision Making

Last but not least, apply Bias-Free Decision Making: Shift from intuition-based decisions to AI-driven analysis to minimize bias and enhance precision in strategic planning.

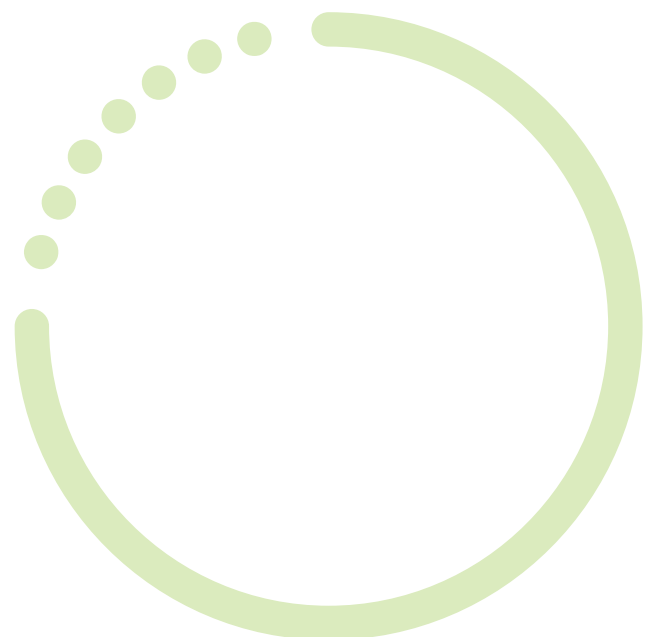
The introduction of AI in the modelling process allows for an accuracy that was previously unattainable. By standardizing complex decisions and reducing the intervention of analysts in tasks like parameter selection, checking deeper assumptions (such as endogeneity), and trend decomposition,

the consistency and precision of the results are enhanced, shifting the approach from assumption to AI-driven certainty.

By following these guidelines, the historical challenges faced by traditional methods, such as limitation in speed, reliable measurement of simultaneous factors, and the ability to achieve more granular learnings due to manual handling and human involvement, can be overcome.

Merging Numbers

with Business
Acumen



A combination of AI and human expertise is focused on the primary goal: driving maximum value through a lens of incrementality.

A crucial part of any model is to make the numbers talk, this involves integrating a business perspective to translate data into actionable decisions and drive business growth.

In the field of advertising effectiveness measurement, the integration of this approach becomes especially significant since the critical role of analysts is to interpret the context and ensure that the outputs align with market realities. Robust but business-wise misaligned outputs are not uncommon, ranging from negative advertising effects to high-return channels with residual investment, requiring fine-tuning during the calibration process. These

adjustments have traditionally been guided more by marketers' professional expertise than by AI-driven approaches.

However, how accurate is this reliance on intuition? It turns out to be no more accurate than random chance. **According to a study by the Ehrenberg-Bass Institute⁵, marketers' predictions about advertising effectiveness fall short of statistical significance, erring in 49% of cases.**

Leading us to the core matter, **how can you confidently measure the true value of your marketing efforts?**

[5] Hartnett, N., Kennedy, R., Sharp, B., & Greenacre, L. "Marketers' Intuitions about the Sales Effectiveness of Advertisements." *Journal of Marketing Behavior*, vol. 2, no. 2-3, 2016, pp. 177-194. <https://doi.org/10.1561/107.00000034>.

Calibration based on ground-truth methodologies: Studies such as 'Experimental Calibration of MMM: Evidence from 18 Case Studies.'⁶ highlight the effectiveness of incorporating experiments into this process. These studies reveal an average 15% adjustment in ROAS post-calibration.

MMM calibration can be manually executed by carefully selecting models that align closely with the results from incrementality tests. A more thorough method constrains the range of possible solutions, ensuring they are realistic and based on previous findings. In contrast, Robyn introduces a streamlined approach. Not only does it allow the direct inclusion of experimental results, but its latest version also bridges the gap between the distinct nature of experimental results and MMM by accounting for the adstock effect. This allows for targeted calibration of specific aspects of media impact, providing a unique advantage in precision.

How is business acumen integrated?
Manually selecting the appropriate model is a time-consuming task, involving many subjective decisions and requiring extensive modelling experience. This process typically entails trial and error over hundreds of iterations, often translating into months of work. One method to achieve this alignment more efficiently is through Bayesian frameworks, which enhance the reliability of results by incorporating business insights into the priors. Alternatively, Robyn utilizes a KPI that compares how far is the optimized allocation from the actual one, balancing model accuracy with business relevance.

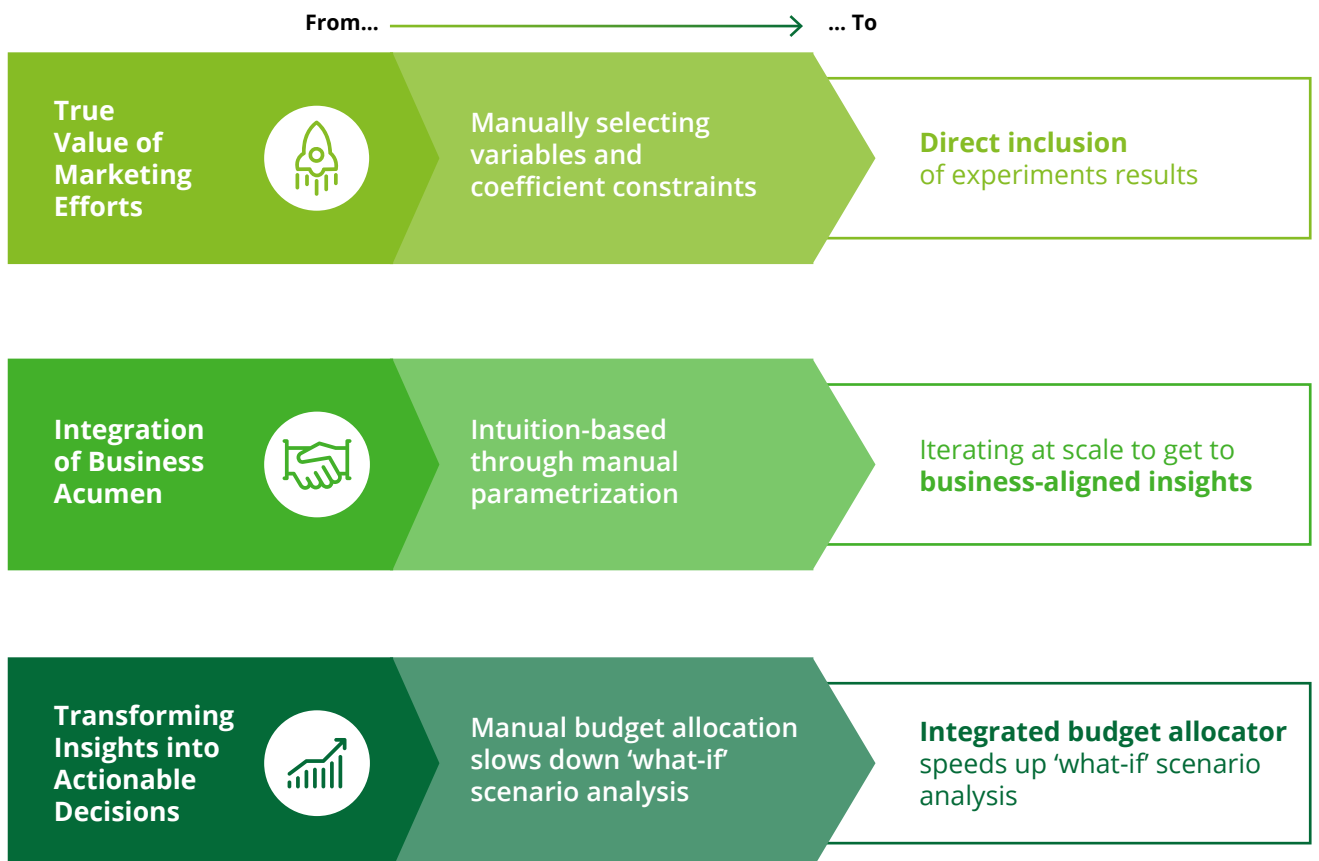
[6] Meta Platforms, Inc. "Experimental Calibration of MMM: Evidence from 18 Case Studies." Facebook GeoLift, 2022, <https://github.com/facebookincubator/GeoLift/blob/main/Whitepapers/MMM%20Calibration/Experimental-calibration-of-MMM-evidence-from-18-case-studies.pdf>.

How to transform insights into actionable decisions to ensure business growth? Using 'What if' scenarios derived from model data to guide strategic budgeting decisions.

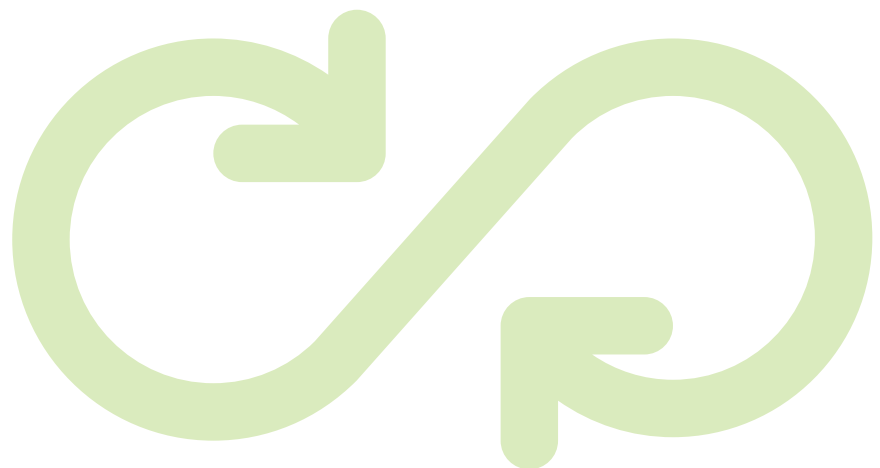
Forecasting various budget distributions is a multifaceted challenge because it not only considers marketing spend and channel performance but also takes into account each business's specific limitations and strategic objectives. Without these tailored constraints, budget allocation recommendations could become impractical, leading to underfunding of strategic channels while others may receive disproportionate allocations.

There are different open-source libraries, such as Pyomo that offer extensive configurability for users who need to tailor every aspect of their optimization problems, from parameter settings to problem definitions. This flexibility allows for a highly customized approach, though it requires a more hands-on, artisanal effort in setting up.

Other possibilities are the ones brought to the table by Robyn. Robyn's integrated budget allocator provides a much simpler and more immediate solution for what-if scenarios. With its easy-to-understand outputs and pre-configured settings, it is perfect for those who prioritize convenience and speed.



Always-On Marketing Mix Modelling



Once the efficacy of our model is confirmed by applying the results and verifying their contribution to incremental growth, **how can it be scaled to ensure it evolves as a dynamic and integral tool within strategic frameworks?**

Regular Updates are crucial to aligning MMM with evolving strategic needs. This addresses concerns about the traditionally slow-moving nature of MMM and ensures it keeps pace with market changes.

For companies maintaining a consistent refresh of MMM over seven years, we have observed an average growth of 151% in ROAS.

**Relevance of continuous measurement to maximize the impact of advertising strategy
Graph of ROAS improvement (x4) following continuous application of MMM**

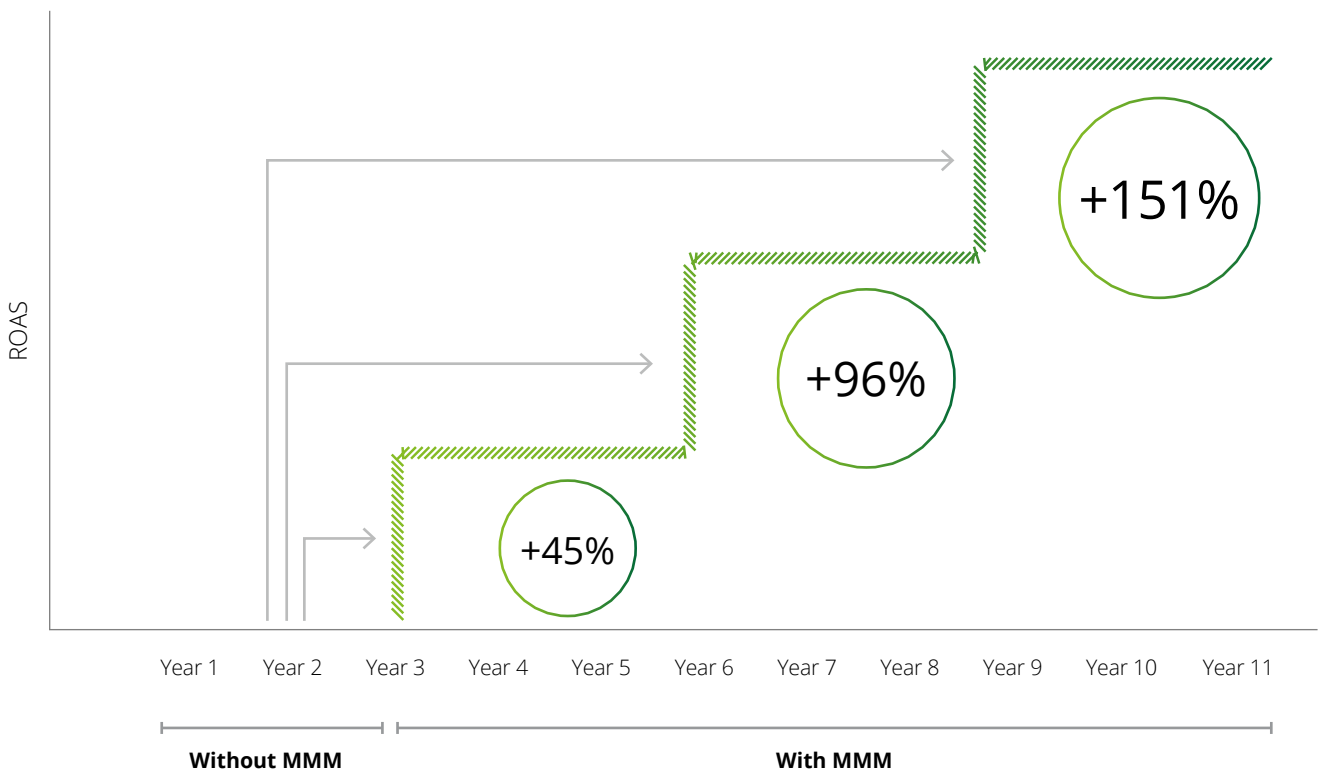


Chart4: Relevance of continuous measurement to maximize the impact of advertising strategy.

Refreshing MMM results at least once a year is the minimum recommendation.

Updating twice a year is considered a healthy practice, quarterly updates represent a constant process, and monthly updates ensure an always on approach.

For the last part, providing executives with customized, easy-to-understand dashboards and reports that offer at-a-glance insights into marketing impacts is essential. These tools help in making informed decisions quickly, enhancing the responsiveness of the model to changes in marketing strategies and market conditions.

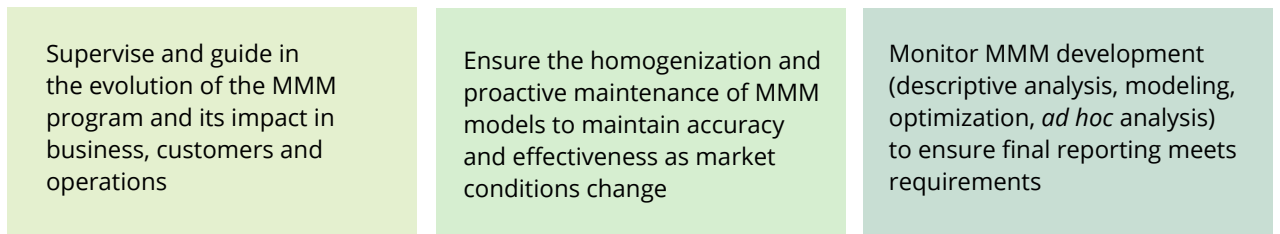
Identifying the right mix of stakeholders to oversee the MMM process is critical. Integrating a steering committee and determining which roles will be key in guiding and supervising the progress of MMM and most importantly, adopting its recommendations, is fundamental to the successful integration of the model into the company's strategic operations.

We recommend different levels of coordination from a more strategic to a more tactical vision, ensuring the optimal fit between business and analytics needs.

COMMITTEE



GOALS



ROLES

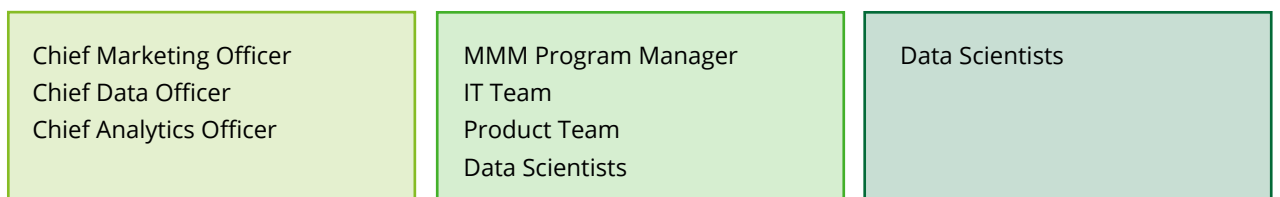


Chart5: Levels of coordination from a more strategic to a more tactical vision.

Conclusion

Innovation fostered by Open-Source Tools

unlocks unprecedented opportunities to measure marketing efforts effectively allowing to **understand not only what's working but to optimize and adapt to the new AI-driven marketing strategies.**

They enhance agility by allowing for the generation of new scenarios and frequent updates, dramatically increasing the speed and flexibility of strategic decision-making. By integrating business acumen and aligning closely with the realities of business operations, the company can become an AI-driven Marketing Mix entity. It is crucial to maintain the company's vision and strategic frameworks, ensuring that MMM remains an always-on process.

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