Bringing the Consumer in the Mix: Using Agent-Based Modeling to Power Marketing Mix Optimization

informs New York Metro Chapter
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The Marketplace is Changing Rapidly

- More diversity among consumers
- More fragmented media consumption
- More marketing options
- More ways to buy
The Demand for Marketing Accountability is Rapidly Increasing

“Corporate marketing is the last bastion of unaccountable spending.”

- Google Chairman
  Eric Schmidt
The Changes are Creating New Challenges for Marketers

- What size budget do we need?
- How do we best allocate the budget?
- How do we efficiently reach target segments?
- What are the short- and long-term effects?
Marketers Are Struggling to Meet the Challenges

- **65%** of CMOs told IBM they are “underprepared” for the growth in channel & device choices, 63% said it for demographic shifts.
- **54%** of marketing execs told BCG they do not have the tools required to make trade-offs across media vehicles.
- **>50%** picked “measurement, analysis and learning” and “integrating cross-channel marketing” as #1 and #2 challenges in a Unica poll.
- **9%** of marketing execs informed the CMO Council that they have a highly evolved, integrated marketing model.
The marketing function is evolving

- **Planning**: From Annual to Agile
- **Branding & Communication**: From Mass to Engaged
- **Execution**: From Silo’d to Integrated
- **Analysis**: From Historical to Forward-Looking
- **Organizational Behavior**: From Cabals to Collaboratives
A ThinkVine Marketing Mix Optimization Success Story

• **Business Goals**
  • Acquire new customers with high lifetime value
  • Find the optimal spend level and the ROI of tactics

• **Discoveries**
  • Using ThinkVine software the company discovered
    • A significant shift from traditional media to digital would meet goals
    • The effect of each marketing tactic on acquisition volume and its ROI
    • The likely effects of new marketing tactics at scale
    • The shift to digital would affect brand awareness in future years

• **Actions**
  • Made shift to digital, beat customer acquisition targets in first year
  • Adjusted mix in second year to better balance short- and long-term
  • Began integrating detailed digital data into planning
Marketing Mix Optimization Options

Regression-Based Mix

Agent-Based Mix

\[ Y = a + b_1 X_1 + b_2 X_2 + \ldots + b_k X_k + e \]
Marketing Mix Optimization Options

<table>
<thead>
<tr>
<th>Regression-based Mix</th>
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### Marketing Mix Optimization Options

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<th>Agent-based Mix (ThinkVine)</th>
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<tr>
<td>Deterministic approach</td>
<td>Complex systems approach</td>
</tr>
<tr>
<td>Consultant/agency or internal teams do as a project</td>
<td>Delivered within a simulation / planning software system</td>
</tr>
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<td>Historical analysis with some granularity “teased out” of the top-down model. Only “sees” large amounts and variances</td>
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</tr>
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<td>Forecasts extend history. Validity is bounded by % change. Granularity is often constrained. No consumers or new tactics in the forecast</td>
<td>Forecasts via forward-looking scenarios that make extensive use of custom consumer response data for all marketing types and levels</td>
</tr>
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<td>Forecasts are typically one number. Accuracy has a short half-life</td>
<td>Forecasts are multi-dimensional with significant granularity. High accuracy over long periods</td>
</tr>
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<td>Fixed form equations, changes are effectively new projects</td>
<td>Ongoing data updates, periodic recalibration if needed as part of subscription</td>
</tr>
<tr>
<td>No collaboration capability. No saved plans, typically no saved forecasts</td>
<td>Built-in collaboration functionality. Plans and forecasts are saved in the software</td>
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Organizational Profiles Influence the Decision

Regression-Based Mix

• Familiarity with regression is important to organization
• Marketplace is changing slowly
• Only use a few types of marketing, don’t plan to try new things
• Limited or no segmentation
• Minimal competition
• Plans are made once per year and rarely adjusted
• Collaboration with &/or second opinion of agency isn’t important
• Okay with time lag for new projects to get updates
• Internal or low-cost source

Agent-Based Mix

• Organization is open to change, uses analytics for competitive advantage
• Marketplace is changing rapidly
• Use many types of marketing, experimenting with new things
• Segmentation is important
• Active competition
• Plans are updated throughout the year based on results
• Collaboration with &/or second opinion of agency is important
• Want to run scenarios themselves
• Want to synchronize and integrate planning and execution
## Mix and Digital Cross-Channel Attribution Have Different Roles

<table>
<thead>
<tr>
<th></th>
<th>ThinkVine MMO</th>
<th>Digital X-Channel Attribution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus</strong></td>
<td>Strategic planning</td>
<td>Tactical execution</td>
</tr>
<tr>
<td><strong>Objective</strong></td>
<td>Marketing budget optimization</td>
<td>Campaign conversion optimization</td>
</tr>
<tr>
<td><strong>Emphasis</strong></td>
<td>Achieve key goals</td>
<td>Realize incremental gains</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Effectiveness via behaviour simulation</td>
<td>Efficiency via iterative execution</td>
</tr>
<tr>
<td><strong>Forecasts</strong></td>
<td>Short- and long-term sales forecasts</td>
<td>2-8 week campaign forecast</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td>Breadth across all tactics, consumer segments and channels</td>
<td>Depth within digital</td>
</tr>
</tbody>
</table>

*ThinkVine can integrate detailed digital (and social, etc.) data to create a “virtuous circle” that improves both planning and execution*
A ThinkVine Marketing Mix Optimization Success Story

• **Business Goals**
  • Increase market share in very competitive category
  • Reverse decline in brand awareness

• **Discoveries**
  • Using ThinkVine software the company discovered
    • Erosion in brand recognition was creating an ever-higher hill to climb
    • Competitor’s television blitz had further eroded brand recognition
    • The right budget level, mix and timing could quickly pay back

• **Actions**
  • Won Board approval to increase and shift budget
  • Increased television advertising focused on innovation with corresponding digital content to facilitate path-to-action
  • Achieved objectives within six months, got “second tranche” funding
  • Began digging deeper into the effects of pricing in the mix
Agent-based Modeling (ABM) Overview

“Regression wasn’t invented for marketing mix; it was applied to it.”

Agent-based modeling isn’t new

ABM has been around since the 1940’s with roots in the hard sciences

Very good at understanding how many moving parts influence an outcome

Used extensively by Boeing, WHO, DoT
Agent-based Modeling (ABM) Overview

“ThinkVine’s marketing mix optimization software harnesses the advantages of ABM to address the growing complexity in today’s marketing landscape.”

Why hasn’t agent-based modeling been applied to marketing until now?

- Lack of need – yesterday’s marketplace was less complex, more homogeneous
- Lack of computing power – simulations are computationally intensive to run
- Lack of data & applied IP – about consumer response to marketing
ThinkVine’s Software: “Sim City for CMOs”

- ThinkVine’s marketing mix optimization software enables you to simulate the results of marketing plans in a marketplace with behavior that matches yours.

- It combines demographic, consumer behavior and market data with your data and advanced analytics to deliver the forward-looking information you need to maximize results – accurate forecasts with rich, multidimensional information by consumer group, type of marketing, product, channel and geography.
Find the Optimal Investment Level to Meet Your Objectives

The software enables your team to easily run “What If?” scenarios. You can find the optimal investment levels to meet various strategic and tactical objectives.
Identify the Marketing Plan Most Likely to Deliver the Best Results

Comparison of 2012 Marketing Plan Alternatives

- The software enables fast, objective comparisons of marketing plan alternatives. You can vary spending levels, timing, mix of tactics and consumer groups targeted.
Discover Which Marketing Tactics Will Yield High ROI

ROI by Type of Marketing Activity

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>2010</th>
<th>2011</th>
<th>2012 Proj</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Advertising</td>
<td>$4.32</td>
<td>$4.17</td>
<td>$3.89</td>
</tr>
<tr>
<td>Re-Targeting</td>
<td>--</td>
<td>--</td>
<td>$2.99</td>
</tr>
<tr>
<td>Search Non-Branded</td>
<td>$7.24</td>
<td>$6.89</td>
<td>$2.43</td>
</tr>
<tr>
<td>Search Branded</td>
<td>$8.23</td>
<td>$7.12</td>
<td>$2.74</td>
</tr>
<tr>
<td>Magazine</td>
<td>$1.35</td>
<td>$1.12</td>
<td>$1.14</td>
</tr>
<tr>
<td>Newspaper</td>
<td>$1.23</td>
<td>$0.95</td>
<td>$1.16</td>
</tr>
<tr>
<td>TV</td>
<td>$1.67</td>
<td>$1.34</td>
<td>$1.45</td>
</tr>
<tr>
<td>Radio</td>
<td>$0.76</td>
<td>$0.67</td>
<td>$0.53</td>
</tr>
<tr>
<td>Direct Mail</td>
<td>$0.23</td>
<td>$0.34</td>
<td>--</td>
</tr>
<tr>
<td>Feature/Display</td>
<td>$1.22</td>
<td>$1.16</td>
<td>$1.21</td>
</tr>
<tr>
<td>FSI</td>
<td>$1.31</td>
<td>$1.45</td>
<td>$1.41</td>
</tr>
<tr>
<td>Account Specific Mktg</td>
<td>$0.91</td>
<td>$1.02</td>
<td>$1.03</td>
</tr>
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- The software analyses and predicts how marketing tactics influence purchases.
- You see granular information about how each performs in the context of the overall plan.
Learn What Works Best by Consumer Segment

Marketing Tactic Effectiveness By Consumer Group

- The software reveals how well marketing tactics work alone and in combination by consumer group. You can tune your mix to efficiently reach segments you target.
Understand the Short- and Long-Term Value of Marketing

The software forecasts current and future year effects of marketing plans. You can see the cumulative value of new marketing strategies and initiatives.

**Effect of Proposed Marketing Plans By Year**

- **2012**: Base 74%, 26% effect
- **2013**: Base 50%, 22% effect, 28% proposed
- **2014**: Base 38%, 25% effect, 19% proposed

“Brand value”

- 81% Base
- 78% Base (2013 Plan)
- 2014 Plan
- 2012 Plan
- Pre-2012 Base

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Forecast Results of New Marketing Initiatives

Unit Sales Forecast

<table>
<thead>
<tr>
<th></th>
<th>2012 Original</th>
<th>2012 Add Mobile</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Units ('000s)</td>
<td>36,928</td>
<td>38,109</td>
<td>3%</td>
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The software provides information about the likely value of all marketing tactics, including tactics not used before. You understand the potential before you invest.
Our Approach

ThinkVine replicates reality by creating a custom, simulated marketplace in which you can measure purchase behavior across consumers and by marketing activity.

1. **Build Agent Population**
   Consumer agents are configured to be highly representative of a population using demographic and media consumption data.

2. **Add Customer Data**
   The agents’ behavior is informed by customer-supplied data about the category, the product, pricing, marketing activity, etc.

3. **Create Market Model**
   ThinkVine’s experts develop a custom model in which the agents respond to marketing activity and make purchases within the category in a realistic way.

4. **Ongoing Planning**
   The software enables marketers to quickly and easily run scenarios in a frequently updated marketplace and get a rich, objective set of decision-making information.
• We mathematically recreate a representative population of target markets by statistically drawing from empirical distributions of many variables
• Targeting variables include geography, income, age, ethnicity, etc.
Building an Agent Population

**Media Consumption**

- We assign the agents media consumption behavior by tapping a variety of widely-accepted sources of consumer behaviour data
- We use patent-pending IP to sample from these known distributions and assign media exposure probabilities
- As a result, some agents watch a lot of television (and have higher exposure probabilities) while others will watch little to no television (and have lower probabilities)
Building an Agent Population

**Consumer Agents**

- The software now contains a marketplace of agents that is representative of the consumers in your marketplace.
- It also contains marketing science-based rules about response and purchase behaviour.
Required Data

**Marketing plans**
Media, promotion, marketing, digital

**Sales data**
Syndicated data, internal sales data

Enhance & Improve Your Results

**Market research data**
Segmentation, price elasticity, exogenous factors, additional general and demographic-based media consumption data, etc.
We use the customer data to configure the agents so their purchase behaviour matches how consumers actually purchase within the specific category.

- Category Purchase Frequency: 4
- Brand Awareness: ~90%
- Purchase Probability: ~20%
Creating the Market Model

A “Bottom-up” Approach That Predicts More Accurately

1 **Training the system**

ThinkVine’s analysts develop and calibrate a custom model that recreates past sales from the “bottom up” by establishing consumer-centric rules that fit historical results.

2 **Proving the system**

Once the system is trained, we validate it by comparing the most recent 6 months of actual sales (“hold out” data not used to train the system) to a simulation of that 6 month period.

3 **Using the system**

Once the model has been calibrated & validated, it is ready to accurately forecast future sales and provide rich decision support information for each marketing plan and “what if” scenario.

<table>
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<th>Train</th>
<th>Prove</th>
<th>Use</th>
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<tr>
<td>Calibration using demographic, consumption, plan, research &amp; sales data</td>
<td>Validate with hold out data</td>
<td>Forecasts</td>
</tr>
<tr>
<td>2 Years Sales History</td>
<td></td>
<td>1-2 Quarters</td>
</tr>
<tr>
<td>Simulated</td>
<td>Actual</td>
<td></td>
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![Graph showing simulated versus actual sales data over time.](image)
## ThinkVine and Partners Deliver Value Quickly and Over Time

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<th>Configuration &amp; Initial Guidance</th>
<th>Agile, objective marketing planning &amp; optimisation</th>
</tr>
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<tbody>
<tr>
<td>• Analysis of recent marketing activity</td>
<td></td>
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<tr>
<td>• Recommendations for immediate changes in the marketing mix</td>
<td></td>
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<tr>
<td>• Accurate forecasts</td>
<td></td>
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<tr>
<td>• Respond quickly to market and budget changes by running “What If?” analyses of marketing plans</td>
<td></td>
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<tr>
<td>• See forecasts with rich information by consumer group, marketing tactic, channels and geography</td>
<td></td>
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<tr>
<td>• Identify new opportunities for growth and savings</td>
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<tr>
<td>• See the effects of media you haven’t tried before</td>
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<tr>
<td>• Create effective, efficient integrated plans across all marketing activities</td>
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<tr>
<td>• Receive expert ongoing marketing support</td>
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Create Scenarios at a High-Level or in Detail
Sample Results: Compare Plans, Review by Tactic, Segment, Etc.
A ThinkVine Marketing Mix Optimization Success Story

• **Business Goals**
  • Increase market share while maintaining margins
  • Improve overall marketing ROI

• **Discoveries**
  • Based on recent success with a specific consumer group, the agency recommended doubling the targeted radio ads at mid-year
  • Using ThinkVine software the company discovered
    • Ads drive traffic to store, but in-store price drives purchase decisions
    • The marginal return from more ads to the group would be very low
    • There was a large consumer group with more upside potential

• **Actions**
  • Adjusted its marketing mix to achieve its business goals
  • Now quantifies all proposed changes via planning software
THANK YOU!

Damon Ragusa
Founder & Chief Strategy Officer
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ThinkVine's marketing mix optimization software provides B2C marketers with the forward-looking information they need to get the maximum return across all of their marketing investments.

See a 2 minute video overview at www.thinkvine.com or call +1 513 842 5900