Introduction to Marketing Analytics
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Outline

- The new realities of marketing decision making
- Marketing Engineering (ME)
- The role of models in ME
- Allegro exercise
Challenges faced by today’s marketing decision makers

- Global, hypercompetitive business environment. More demanding customers served by a greater number of competitors on a global scale.
- Exploding volume of data
  “We’re drowning in data. What we lack are true insights.”
- Need for faster decision making
  Information overload and lack of time, yet decisions have to be made all the time.
- Higher standards of accountability
  Marketing expenditures have to be justified in the same way as other investments.
Need for better marketing decision making

- Intuitive decision making
  - Instinct, gut feelings, past experience, established practices;
  - In a world characterized by rapid change, information overload, greater accountability, etc., intuition is unlikely to generate superior results;
- Data-based, model-supported, and technology-enabled decision making
  - Marketing Engineering
**Marketing Engineering (ME)**

“a systematic approach to harness data and knowledge to drive effective marketing decision making and implementation through a technology-enabled and model-supported interactive decision process.” (LRB, p. 2).
Skills needed for Marketing Engineering

Analytics roles and responsibilities

**Business Skills**
- Delivery managers
  - Deliver data- and analytics-driven insights and interface with end users
- Business leaders

**Data Skills**
- Data architects
- Data scientists

**Technology Skills**
- Data engineers
  - Collect, structure, and analyze data
- Workflow integrators
  - Build interactive decision-support tools and implement solutions

**Analytics Skills**
- Visualization analysts
  - Visualize data and build reports and dashboards
- Analytics translators
  - Ensure analytics solve critical business problems

**Lead analytics transformation across organization**

**Ensure quality and consistency of present and future data flows**

**Develop statistical models and algorithms**
Marketing Engineering

Introduction to Marketing Analytics

- Marketing Environment
  - Automatic scanning, data entry, subjective interpretation

- Data
  - Database management, e.g., selection, sorting, summarization, report generation

- Information
  - Mental models, Decision models

- Insights
  - Judgment under uncertainty, e.g., modeling, communication, introspection

- Decisions
  - Financial, human, and other organizational resources

- Implementation
Models are the core of ME: What is a Model?

- Models are stylized representations of reality that structure our thinking about how the world works;
- Models indicate which factors should be considered and which factors can be ignored;
- By focusing on the relevant factors and their interrelationship, reality can be simplified;
- Models are useful because they facilitate top-down processing (as opposed to bottom-up processing);
**Issues in using models**

- assembling an arsenal of models for a domain of interest;
- retrieving relevant mental models in a given situation;
- being aware of the limitations of mental models (they may overrepresent and underrepresent, or even malrepresent, things);

“No model is true, but some models are useful.”
Types of models

Verbal
“Sales are a function of advertising”

Box and Arrow
- Advertising
- Sales

Graphical

Mathematical
\[ S = a + b A + e \]
**Response models in the decision loop**

- **Marketing actions (inputs)**: Product design, Price, Advertising, Selling effort, etc.
- **Competitive actions**: Response Model
- **Observations (outputs)**: Awareness, Preferences, Sales
- **Environmental Conditions**: Control, Adaptation
- **Objectives**: Evaluation

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**Introduction to Marketing Analytics**

- **Response models in the decision loop**: A model that describes the interactions between marketing actions, competitive actions, and observations. It includes environmental conditions, objectives, and a feedback loop for control and adaptation.
A simple (linear) response model

Sales as a function of advertising spending
A simple (linear) response model

Actual and predicted sales as a function of advertising spending

- **Predicted sales**
- **Actual sales**
### A simple (linear) response model

**SUMMARY OUTPUT**

**Regression Statistics**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
<td>0.95</td>
</tr>
<tr>
<td>R Square</td>
<td>0.90</td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.88</td>
</tr>
<tr>
<td>Standard Error</td>
<td>151514.77</td>
</tr>
<tr>
<td>Observations</td>
<td>10</td>
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</tbody>
</table>

**ANOVA**

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>Significance F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>1</td>
<td>1568596189164</td>
<td>1568596189164</td>
<td>68</td>
<td>0</td>
</tr>
<tr>
<td>Residual</td>
<td>8</td>
<td>183653810836</td>
<td>22956726354</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>1752250000000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Coefficients**

<table>
<thead>
<tr>
<th></th>
<th>Standard Error</th>
<th>t Stat</th>
<th>P-value</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>9906547.3</td>
<td>33.8</td>
<td>0.0</td>
<td>9231139.1</td>
<td>10581955.5</td>
</tr>
<tr>
<td>Advertising</td>
<td>2.1</td>
<td>8.3</td>
<td>0.0</td>
<td>1.5</td>
<td>2.7</td>
</tr>
</tbody>
</table>
How to build a model

- Specify the model
  - Variables (*which ones to include*)
  - Relationships, interactions, dynamics (*how they are linked*)

- Calibrate the model
  - Statistical estimation with real (historical) data
  - Experimentation
  - Managerial judgments

- Validate the model
  - Face validity (*does it make sense?*)
  - Global fit (*$R^2$, model fit*)
  - Variable significance (*correct signs, t-tests*)

- Apply the model
  - Ease of use
  - Usefulness
Introduction

Following are two business plan spreadsheets for the same company, Allegro. You have just been assigned to be the brand manager and must formulate a plan for next year. As you will see, the projected profits for 2006 are higher than the plan for 2007. To make a good impression, you need to develop a plan that will deliver higher profits in 2007. Your job is to use each spreadsheet to determine the optimal level of price, advertising, and selling.

How to use this spreadsheet

Start with the Simple spreadsheet. It is a traditional spreadsheet. Use this as an aid to help you think about optimal spending levels, and how this might affect market shares and net profits.

Go to the second spreadsheet. It is a "smart" spreadsheet where projected market share is a function of price, advertising and distribution spending. If you change the planned price, sales (and contribution margin) will change.

Not surprisingly, as you lower price, volume increases, but the contribution margin decreases. As you increase advertising or selling effort sales volume increases. These response functions came from managerial judgment, but could just as easily come from statistical analysis of past data.

Assume these estimates are reasonably good; however, change them if you think it is a good idea.

Bright yellow indicates a cell you should change.

Faded yellow indicates a cell you are allowed to modify. Do this only if you have good reasons to do so.
# The Allegro exercise: Simple sheet

## Allegro Market Simple Sheet

<table>
<thead>
<tr>
<th></th>
<th>This year (current)</th>
<th>Next year (projected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Sales, in Units</td>
<td>2,200,000</td>
<td>2,345,700</td>
</tr>
<tr>
<td>Company Market Share</td>
<td>3.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Price per Unit</td>
<td>$250</td>
<td>$250</td>
</tr>
<tr>
<td>Variable Cost per Unit</td>
<td>$150</td>
<td>$150</td>
</tr>
<tr>
<td>Gross Margin per Unit</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>Sales Volume in Units</td>
<td>66,000</td>
<td>69,678</td>
</tr>
<tr>
<td>Sales Revenue</td>
<td>$16,500,000</td>
<td>$17,419,532</td>
</tr>
<tr>
<td>Gross Contribution Margin</td>
<td>$6,600,000</td>
<td>$6,967,813</td>
</tr>
<tr>
<td>Overhead</td>
<td>$3,500,000</td>
<td>$3,900,000</td>
</tr>
<tr>
<td>Net Contribution Margin</td>
<td>$3,100,000</td>
<td>$3,067,813</td>
</tr>
<tr>
<td>Advertising</td>
<td>$900,000</td>
<td>$900,000</td>
</tr>
<tr>
<td>Sales Force and Distribution</td>
<td>$1,000,000</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Marketing Research</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Net Profit</td>
<td>$1,100,000</td>
<td>$1,067,813</td>
</tr>
</tbody>
</table>

## Marketing Mix Decisions

<table>
<thead>
<tr>
<th></th>
<th>This year (current)</th>
<th>Next year (projected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price per Unit</td>
<td>$250</td>
<td>$250</td>
</tr>
<tr>
<td>Advertising</td>
<td>$900,000</td>
<td>$900,000</td>
</tr>
<tr>
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<td>$1,000,000</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>
Questions

▪ Using the Simple Sheet, what happens when Allegro cuts advertising and selling effort to 0$ and raises price to $500/unit? Comment.

▪ Repeat exercise 1 using the Smart Sheet.

▪ Using the Smart Sheet, what is the profit maximizing level of advertising, selling effort and price? (Hint: Requires Solver) Would you recommend the firm implement this policy? Why or why not?

▪ What if the firm's goal was not to maximize profit, but to maximize market share while maintaining profit at no lower than last year's level. (Hint: Requires Solver—and be sure to start with a feasible level of profit). Compare this policy to the one you found in the previous question.

▪ Comment on the strengths and limitations of a response function approach (Smart sheet) like this in practice.
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- Using the Simple Sheet, what happens when Allegro cuts advertising and selling effort to 0$ and raises price to $500/unit? Comment.
- Repeat exercise 1 using the Smart Sheet.
- Trial and error using the Smart Sheet.
- Using the Smart Sheet, what is the profit maximizing level of advertising, selling effort and price? (Hint: Requires Solver) Would you recommend the firm implement this policy? Why or why not?
- What if the firm's goal was not to maximize profit, but to maximize market share while maintaining profit at no lower than last year's level. (Hint: Requires Solver—and be sure to start with a feasible level of profit). Compare this policy to the one you found in the previous question.
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Assignment for next class

- Read LRB Chapter 3
- Download Segmentation.pptx or Segmentation.pdf
- Read the Segmentation Tutorial (Enginius)