

PREDICTIVE SIMULATION MODELING FOR R&D AND MARKETING GUIDANCE

*- Using Mined Sensory, Benefits, Claims and Emotions Inputs
For New and Reformulated Product Simulations -*

Prepared by:

WACS Insights & Strategy

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BACKGROUND

Several **WACS I&S** clients have expressed interest in conducting predictive modeling in lieu of actual consumer product testing or other types of attitudinal and behavioral survey research. These organizations want to offset the expense of conducting actual research studies by undertaking a program of data mining—specifically, modeling previously collected consumer response, plus attitudinal, behavioral and emotional response data—to simulate future marketplace response to new and reformulated products, or marketing and messaging tactics.

- From their previous work, our clients have accumulated abundant data sets consisting of emotions, benefits/claims variables and sensory attributes. There exists an opportunity to statistically model these variables to create algorithms which will be used to simulate new and reformulated product marketplace scenarios. There are some dependent variables that already exist (e.g., market share, trial rate, sales revenue, purchase interest), also some other interesting ones that we can create (e.g., competitive share and trial, volumetric spending, etc.).
- The following will outline the procedures, methods, applications, requirements, and timing which factor into the development and implementation of this modeling/simulation capability.
- **WACS I & S** has had great success using the following plan of action as a dynamic optimization tool for optimization of overall R&D and marketing efforts.

WACS I & S' CASE HISTORY MODELING EXPERTISE

WACS Insights & Strategy has accrued extensive case history experience in data mining and simulation modeling, for many of its clients.

- We have succeeded at linking independent variables (emotional brand perceptions and rational end-benefits, sensory attributes) with dependent variable decision-making measures such as purchase intention, brand choice, market share, brand loyalty, volumetric spending.
- We have developed Bayesian models needed to simulate strategies for product development, marketing and branding.
- As a result of this experience, **WACS I & S** brings a powerful learning curve to any client's modeling program which is designed to guide corporate Marketing and R&D teams.
- Utilized predictive model which was instrumental in identifying the points of share leakage for our financial services, packaged goods, HBA, toys and telecom clients.
- Provided blueprints which led to development and launches of several of our clients' new, reformulated or repositioned brands:
 - ✓ Confectionary, frozen confectionary
 - ✓ Communications infrastructure software products
 - ✓ Men's shaving products
 - ✓ Home entertainment
 - ✓ Office document handling
 - ✓ Financial services, life insurance, money transfers and wiring
 - ✓ Radio listenership
 - ✓ Fast food and restaurants
 - ✓ Online auto car buying tool
 - ✓ Auto warranty
 - ✓ Auto rental
 - ✓ Toys and videogames
 - ✓ Breakfast foods
 - ✓ Fragrance
 - ✓ Alcoholic beverages

OVERVIEW OF WHAT WE DELIVER

WACS I & S simulated modeling provides a comprehensive toolset for simulating market shares of products based on their key attributes, a simulation capability that will reveal resulting market share, trial potential, purchase interest scores based on the 'what if' inclusions of specified, select product claims, benefits, sensory, and emotional variables which we will have factored into in a regression equation based algorithm.

- Using backlog of attributes (emotions, benefits/claims variables and sensory attributes):
 - ❖ E.G., if R&D wanted to pursue development of a new product which contained and delivered a sub-set of attributes (hypothetical) #'s 17, 23, 34, 45, 56, 57, 63, 65, 89, 94, 97, 101, 109,111 and 122, it will be important to know in advance what the impact of this attribute set would be on market share, trial , sales volume and purchase interest.
 - ❖ Also, response to competitive reply can also be obtained. A market simulation delivered by **WACS I & S** would provide an optimized response.
 - ❖ All simulations and predictions would be provided by total sample, by heavy users, by age target—by any behavioral, attitudinal or demographic segment contained and developed in any previous studies from which we mine relevant back data.
- Any number of such simulations can be implemented, using sub-set combinations of the array of total attribute inputs.

GENERAL OVERVIEW OF PROCEDURE

To achieve an optimized product, first, we'd need to develop a deeper understanding of consumer response to products in the category, as embodied in all previous relevant studies and tests—we would need to understand all of the sensory, benefits, claims, emotional attributes and characteristics which drive consumer preference. To accomplish this, the following steps would be taken:

For Building the Model Simulator:

1. Stakeholders' meeting to uncover basic brand management needs, expectations relative to this program
2. Investigate the homogeneity of consumer data through hierarchical cluster analysis.
3. Perform preference mapping analysis. This is a method that provides product development directions for developers (R&D) to see a whole picture of products, liking and relevant descriptors.
4. Conduct descriptive analysis to objectively characterize sensory attributes and to relate this to preference ratings.
5. Develop internal preference and external preference maps to gain insights about the direction and intensity of individual consumer preferences for the sensory attributes and other attributes. In this regard, we will use Two external preference mapping techniques, Two-step Cluster Analysis (TCA) followed by Generalized Procrustes Analysis (GPA).
6. Conduct a multivariate analysis to examine the relationships between descriptive sensor and sensory preference data and between descriptive packaging and other consumer data.
7. Perform a Landscape Segmentation Analysis (LSA) or hierarchical cluster analysis (HCA) of sensory preference data in order to classify consumers and identify drivers of acceptance.
8. Develop a Bayesian network that describes the overall market.
9. Perform the optimization in order to determine the optimal level of each attributes and the unique product configurations, as well as the baseline product scenarios.
10. Separate all variables into Market Variables and Scenario Variables.
11. Testing the model by predicting preference for other similar products within the range of the calibration samples used to build the model.

GENERAL OVERVIEW OF PROCEDURE (cont.)

For Simulation and Optimization:

1. Simulate Market Share generated by brand prototype with the Bayesian Market Simulator.
2. Perform Substitution and Cannibalization Effect analysis.

PROCEDURE

Step 1:

- Consultation meeting with Brand Management Team Stakeholders:
 - ✓ Identification of general issues with respect to previous studies/tests; selection of variables to be inputted into algorithm
 - ✓ Review of vocabulary of sensory, benefits, claims and emotions
 - ✓ Understanding of R&D needs/plans for coming year; understanding nature of simulations

Step 2:

- Audit of previous tests, studies, questionnaires
- Examination of data files from all past studies, tests
- Identification and extraction of selected variables based on previous consultations, discussions with Brand Management Team

PROCEDURE (cont.)

Step 3:

- Collection, arranging and cleaning data
- Development of data matrices
- Data augmentation and averaging

Step 4:

- Bayesian statistical analysis:
 - ✓ To gain understanding of consumer acceptance of goods.
 - Determine the characteristic distribution of each input variable. Very important to know as much as possible about each variable. Incorrect assumptions about how a given variables values are distributed could invalidate the model.
 - Determine the associated distribution parameters of each input (a) The mean & SD for normally distributed inputs, (b) the likelihood of each value for binary inputs (such as yes/no states for emotions along with their likelihood of occurring (c) define the min and max values for uniformly distributed inputs (e.g., manufacturing costs), the min and max values and the most likely to occur values for triangular distributions (associated with variables like sales history and inventory levels).
 - ✓ Development of External Preference Mapping
 - ✓ Fitting the consumer data in the sensory space

PROCEDURE (cont.)

Step 5:

- Development of Predictive Model

Step 6:

- Implement market simulations and optimizations as requested by Brand Management Team

BENEFITS OF OUR SOFTWARE AND MODELING APPROACH

We employ what is known as a Bayesian Network approach to developing a predictive model and market simulator. It is superior to all other simulation model options: it is the fastest to implement, most accurate, cost efficient, robust, predictive, reliable, sensitive, and flexible compared against any other simulation option (e.g., Monte Carlo methods, Choice-Based Simulation, basic regression options):

- It provides the most reliable prediction of market share, trial for a new or reformulated product
- It is the most cost efficient option since it yields greater face validity (reflecting marketplace sales performance), hence there is less need to spend money updating the model with re-run surveys to reflect marketplace realities
- The market is never static, always dynamic. With our approach, it is most amenable to update simulations by inputting variables such as revised pricing, sales volume promotion activity and buzz levels to have the model reflect current conditions
- It is the most proficient model for simulating response to competitive efforts, based on inputting sales data, promotion activity, social media levels, etc.
- Of course if you've worked with this sort of data before ,you're probably aware that there are strong "halo effects" (multi-collinearity) present in the data (i.e. a strong concept gets high ratings almost across the board on the independent variables while a weak concept gets lower ratings almost across the board).
 - This kind of data pattern wreaks havoc on regression analysis by causing multi-collinearity— In a nutshell, it can cause very unstable weights and even weights with the wrong sign.
 - As a result, our Bayesian approach uses robust methods to counteract the multi-collinearity issues we expect to be present in such data. Since no assumptions need to be made regarding the form of links between variables, potentially nonlinear or multi-collinear patterns are therefore not an issue for model estimation or simulation.

MATERIALS NEEDED IN ORDER FOR **WACS I & S** TO BEGIN MODEL DEVELOPMENT

1. All previous data files for tests, studies containing the key attribute variables which will comprise the algorithm used for simulation
2. Tab specifications, data layout maps used to array data, produce tabulations, files
3. All related questionnaires used for such tests, studies

TIMING

TOTAL TIME REQUIRED: 5.2 Working Weeks from start through initial simulations

Step 1:

- Consultation with Stakeholders:
 - ✓ Identification of general issues with respect to previous studies/tests; selection of variables to be inputted into algorithm
 - ✓ Review of vocabulary of sensory, benefits, claims and emotions
 - ✓ Understanding of R&D needs/plans for coming year; understanding nature of simulations

TIME REQUIRED: 1 Day

Step 2:

- Audit of previous tests, studies, questionnaires
- Examination of data files from all past studies, tests
- Identification and extraction of selected variables based on previous consultations, discussions with Brand Management Team

TIME REQUIRED: 1 Week

TIMING (cont.)

Step 3:

- Collection, arranging and cleaning data
- Development of data matrices
- Data augmentation and averaging

TIME REQUIRED: 1 Week

Step 4:

- Bayesian statistical analysis:
 - ✓ To gain understanding of consumer acceptance of goods:
 - Determine the characteristic distribution of each input variable. Very important to know as much as possible about each variable. Incorrect assumptions about how a given variables values are distributed could invalidate the model.
 - Determine the associated distribution parameters of each input (a) The mean & sd for normally distributed inputs, (b) the likelihood of each value for binary inputs (such as yes/no states for emotions along with their likelihood of occurring (c) define the min and max values for uniformly distributed inputs (e.g., manufacturing costs), the min and max values and the most likely to occur values for triangular distributions (associated with variables like sales history and inventory levels).
 - ✓ Development of External Preference Mapping
 - ✓ Fitting the consumer data in the sensory space

TIME REQUIRED: 1 Week

TIMING (cont.)

Step 5:

- Development of Predictive Model

TIME REQUIRED: 1 Week

Step 6:

- Implement market simulations as requested by Brand Management Team

TIME REQUIRED: 1 Week

TOTAL TIME REQUIRED: 5.2 Working Weeks from start through initial simulations

COSTS

Contact us for a cost quote

WACS I & S SIMULATION MODELING DEVELOPMENT PROJECT MANAGEMENT TEAM

Total involvement of both principals towards project completion

Major points of contact on all projects will be
Art Savitt, WACS CEO
Jim Frisch, PhD, WACS President

Jim Frisch has over 30 years of professional market research experience. Jim has served in a number of executive and managerial level positions:

- WACS I & S (President: June 2002)
- Wolf*Altschul*Callahan-SVP/Director of Research
- Citibank (Research Director)
- Final Analysis-VP
- Young and Rubicam-Associate Research Director
- Heller Research-Associate Research Director
- Sherman Group-Project Manager
- Education: LIU (AB), University of California, Berkeley (PhD in Psychology)
- www.linkedin.com/pub/jim-frisch/5/152/27b

Art Savitt has held the following executive level positions:

- WACS I & S (CEO: June 2002)
- Audits & Surveys Worldwide-SVP Client Services
- Wolf*Altschul*Callahan-EVP/Director of Client Services
- Simmons MRB-SVP Client Services
- Beaumont Organization-EVP MRD/Client Services
- Ted Bates/Worldwide-SVP, MRD
- D'Arcy DeGarmo Advertising-VP, MRD
- Grey Advertising-MRD
- Education: Washington U., St. Louis (AB Psychology), Doctoral Program at Columbia University (Social Psychology)
- www.linkedin.com/in/azsavittceowacsurveystatcons

WACS I & S SIMULATION MODELING DEVELOPMENT PROJECT MANAGEMENT TEAM (cont.)

Art Savitt and Jim Frisch,
supported by **Fred Mavinga**,
WACS I & S Statistician

Fred Mavinga has over 20 years of professional market research experience and has served in a number of executive and managerial level positions:

- WACS I & S (Statistical Consultant)
- The Pert Group (VP, Advanced Analytics)
- MSR Group (Omaha, NE); (VP Market Science/Sr. Methodologist)
- Yankelovich (Director of Research)
- TNS-NFO (Statistical Consultant)
- International Monetary Fund (Research Economist)
- Federal Reserve Bank (Research Economist)
- Sherman Group-Project Manager
- Education: Temple U., (AB), University of Pennsylvania, (PhD in Advanced Econometrics)
- http://www.linkedin.com/profile/view?id=13719740&locale=en_US&trk=tyah

Specializations:

Multivariate and Logistic Regression Analyses
Bayesian Belief Network Modeling
Segmentation, Classification and Regression Tree
Bayesian Modeling Average
Discrete Choice and Price Optimization Modeling
Hierarchical Bayesian Modeling
PLS and Structural Equation Modeling
Optimization and Ad Assess Modeling
Econometric Modeling and Forecasting
Brand Equity Modeling
Life-time Value and Customer Churn Modeling
Predictive Modeling and Data Mining
Marketing Mix Modeling and Market Potential evaluation
Multidimensional Scaling Analysis
Product Optimization, Concepts Testing and TURF
Brand Positioning and Consolidation

FOR FURTHER INFORMATION

WACS Insights & Strategy appreciates your interest in our services.

Should you have any questions or require further information, please contact us.

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