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MARKET SIMULATION SOFTWARE BECOMES SMARTER ALL THE TIME

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Market simulation software is a well-established market research tool that has helped thousands of firms with new product development. Simulation software is a key output from conjoint and discrete choice modeling research studies. With simulation software, it is relatively easy to change the features or price point of a product and have the simulation software predict the market share that the product would attain in the market. The difficulty comes when one tries to find an optimum product, where optimum refers to maximizing the market share, revenue, or profit that the product attains. The problem becomes even more complex when the goal is to optimize an entire product line. There is a solution. The continual advancement of computer processing capabilities has made it possible for the problem to be addressed through the use of linear programming.

Running simulations by trial and error

You have carefully designed a conjoint study. The fielding was conducted methodically. You have processed the data and incorporated it into simulation software to allow you to simulate the market. You can change product features and products and evaluate the impact those changes will have on the market. But you still cannot answer the biggest question, which is "What combination of features will maximize my product's share/revenue/profits?"

Brand	Price	Model	Warranty	Color	Market Share
Ford	$12,000	2-door	30,000 miles	Blue	20%
Toyota	$15,000	4-door	40,000 miles	Red	30%
Chevy	$19,000	4-door	60,000 miles	Blue	40%
Honda	$16,000	2-door	40,000 miles	White	10%

Consider the following example:

Assume the above was the entry screen for the simulation software. You would simply type in the features of the cars, and the software predicts the market share each would attain. We could vary the attributes of one of the cars (such as price, model, warranty length, etc.) and the simulation software would predict the new market share. To develop a car that would result in the maximum market share for one of the cars, we are left with attempting all of the possible combinations of cars. That could be an exhausting and time-consuming task. If there were 10 price points, three models, five warranty lengths, eight colors, and two engine configurations, the possible number of combinations of car from any one manufacturer would be:

10 x 3 x 5 x 8 x 2 = 2,400 combinations

It would take a long time to simulate all of these combinations. But this is a simple example. In most cases, it is not enough to find the optimum configuration of a single product. The goal is to optimize the entire product line. The question then becomes "What features should each of the products have to maximize the overall product line's share/revenue/profits?"

This is a much more difficult exercise because the number of possible combinations of cars and features for three cars is 2,4003 = 13,824,000,000. (Four cars have 2,4004 = 33,177,600,000,000 combinations). Clearly it is impossible to reach the optimal combination of features by trial and error. There are simply too many combinations to test!

Optimization

Basically, the problem is mathematical. We are trying to maximize several equations simultaneously. Previously, we did not have the necessary tools available, but the processing capabilities of today's PC's have allowed for linear programming algorithms of the mathematics world to be integrated with simulation software of the marketing research world to find these optimum product configurations. Once we have specified the parameters for each of the features, the algorithm will identify a combination that maximizes the target (market share). We are now able to address the biggest objective of a conjoint study.

However, finding a combination of features that maximizes market share does not guarantee that revenue or profits are maximized. Most likely, market share is maximized when the products are priced extremely low, possibly so low that they are priced at a loss. At Answers Research, we have taken the advancement of linear programming to solve this problem. If the data is carefully weighted by unit volume, then we can also use linear programming to maximize the product or the product line revenue. Rather than just maximizing the market share attained, the revenue generated by that product line is maximized. We have also discovered that this can be applied to maximizing profit. By incorporating manufacturing and operational costs, we can obtain a product line configuration that maximizes the profits generated by that product line. In an information technology (IT) industry study we recently completed, we developed simulation software that included 30 total products, six of which were our client's products. There were 3.45 x 1039 possible product combinations! Our goal was to reconfigure the entire product line to maximize profits. The final solution turned out to be a two-tier product line in which four of the products were low-end and the other two were high-end products. The results showed some very eye-opening feature combinations previously not considered.

Interpreting the results

These optimization algorithms are powerful analytical tools that make it possible to solve problems that previously could not be addressed, but this does not remove the researcher completely from the equation. As researchers, we still need to examine the solution for viability using our in-depth knowledge of the products and market under study. The algorithms locate the absolute maximum value for market share/revenue/profits, but it is possible that another combination of features can also attain this maximum value, or one that is acceptably close. The features can be "tweaked" to find a product line that is both "optimized" and makes sense from a manufacturing and marketing perspective. A