

# A Marketing Researcher's Guide to Multivariate Analysis

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As marketing researchers, we have all been faced with tight deadlines, clients demanding concise, easy to understand results, and survey tabs as thick as the Manhattan phone book. Burdened with an eighty or ninety question survey and breakdowns by every conceivable demographic, who has not found it difficult to isolate actionable findings quickly and boil them down into a couple of charts and graphs.

Multivariate analysis is a body of statistical techniques that do precisely this job. They were specifically developed to isolate the important relationships between variables and highlight the structure behind what might seem to be a chaotic mass of data. In the hands of a competent analyst, they are tools that can simplify interpretation, provide innovative graphic presentations, and give insights that would be impossible to obtain by simple one and two-way tabulations. In any large or complex study, these are not esoteric frills, but essential tools to speed up and enhance analysis.

These techniques are applicable not only to surveys, but to a broad range of data. Demographics, sales and CIF information are good examples. A multivariate analysis might show that a set of detailed demographics reflects only one or two significant aspects of a population. Another analysis might derive simple customer segments from complex cross-sell data. These are just two examples of the potential of multivariate analysis to increase the value of both internal business information and publicly available data for marketing research purposes.

While they may be essential tools, multivariate techniques demand a fairly sophisticated statistical background to apply correctly. Still, that does not mean that their results cannot be used by researchers at almost any level of technical sophistication. There are analysts who specialize in the area, like IAS in Los Angeles, who can design the analysis and provide output in the form of graphics, tables, and interpretation accessible to any market researcher. These analysts can be used to look at an existing survey or data base, or they can be involved in the research effort from the ground up. If the analyst is involved from the beginning, as I have been with clients such as Pine Company, a full service data processing company in Santa Monica, not only will the results of the multivariate analysis be maximized, but often it can increase the cost effectiveness of the entire research effort.

Rather than summarize the statistical techniques themselves, it is probably more useful to take a look at some of the ways they might be used:

## **Data Reduction, Scaling, and Perceptual Mapping**

One of the most common situations a researcher faces is scaling. Respondents may be asked questions about multiple product attributes or may rate the importance of several product or service characteristics. Often these questions come in groups of twenty or thirty and sometimes (in the case of one of my clients) up to several hundred. While a manufacturer may have strong opinions about two hundred of his or her product's attributes, it is almost certain that the customers look at the product on only a few dimensions. In these situations, tabs often show little difference from question to question. Even when differences are significant, it may be difficult to summarize them by customer characteristics like demographics as these differences would involve multiple questions and appear over many pages of tabulations.

Whole families of multivariate techniques have grown up to deal with just this kind of problem. Used in marketing research under the rubric of perceptual analysis, techniques like factor analysis and discriminant analysis can boil dozens of attributes down to two or three significant, easily interpreted attitudes. Respondents can be scored on these attitudes, differences between respondent groups can be identified, and the differences can be easily graphed.

The case of the client with two hundred attribute questions is a good case study of this use of the techniques. Here it turned out that the attributes represented only three customer attitudes -- suitability to the task, workmanship, and prestige. The client received a set of three dimensional charts that graphically differentiated the market niches of several brands based on the three attitude dimensions. Faced with two hundred independent attributes, it is questionable whether these differences could have been identified, let alone displayed concisely on a few graphs. If this client was planning to do further research, she could have benefited in another way as well. The analysis showed that approximately twenty-five of the two hundred questions served to identify the three attitudes. A future survey could have dropped 175 questions, saving a very significant chunk of the research costs.

## **Market Segmentation**

Market segmentation is the area that most clearly shows the accessibility of multivariate analysis. Almost any clustering scheme is the result of the application of one and often several multivariate techniques. Claritas' PRIZM and Donnelley's Cluster Plus, for example, are the products of this kind of analysis. The huge success of these products stands as a testimonial to the usefulness and clarity of multivariate results.

Any well-designed survey can be subjected to any of a family of multivariate clustering techniques to develop custom segmentation schemes based on the questions included in the survey. If survey respondents or a customer information file has geographic identifiers, records can be linked to census demographics and those demographics can be used to develop a customized, product or service specific clustering scheme similar to the generic model set by Cluster Plus or PRIZM. These customized schemes will provide insights into specific markets that the more general clustering systems cannot. In some cases, like business to business marketing or marketing to niches such as ethnic groups or seniors, these

techniques are almost the only way to obtain statistically sound segmentation information. Ehrlich Transcultural Consultants, a research firm in Woodland Hills, California, has been successful in using these techniques with several ethnic groups.

## **Prediction and Forecasting**

Prediction and forecasting are inherently multivariate. Future sales, or anything else, is dependent on a host of factors such as the economy, demographic changes, or changing tastes. Even in a trend analysis, future activity is generally not a simple function of a straight line projection or moving average. It can be cyclical, have seasonal components, or have complicated lag times, all of which can and must be modeled through multivariate techniques.

Multivariate econometric techniques have been developed to deal specifically with the problems of forecast and projection. These techniques have been highly optimized to obtain mathematically based forecasts with minimum error given the input data. There are widely accepted techniques that deal with interdependencies between predictor variables and between those variables and the passage of time that may not even be apparent in the most detailed tabulations. If not controlled, these interdependencies can lead to very misleading results. While Chase and others use these techniques in very complex models to predict the economy, in most business situations a simple, understandable model is enough to produce clear improvements in predictability over more basic trending or moving average projections.

## **Causal Analysis**

One of the most highly developed areas of multivariate analysis is causal analysis. There is a battery of powerful techniques designed specifically to model and test theories about causation. These techniques can prove their value even when there are as few as three interrelated causes and certainly when causation is two-way or multifaceted. In these situations, even the largest sample may be too small to isolate important causal factors through a tabular analysis. By applying well developed statistical theories, multivariate techniques can leverage the data from even a relatively small sample to provide a way to test detailed hypotheses about the marketplace. If a survey is done to determine the cause of a drop in sales, for example, multivariate techniques provide an objective way to model what those causes might be and determine which among them is most important. If management has a theory concerning the drop in sales, multivariate techniques provide an objective means to evaluate the theory and to elaborate on it.

Multivariate analysis includes a wide range of techniques that can be used in almost any research situation. As such, no simple article can cover all their uses. The purpose here has been more limited. First, it has been to give the reader a taste of the kind of practical questions that multivariate techniques can answer in the marketing research situation.

Second, it has been to stress the cost effectiveness of incorporating multivariate analysis in the research effort from the ground up. By planning for this kind of analysis from the research design phase on, results will be enhanced and ultimately the entire cost of the research effort could be reduced. Finally, and probably more importantly, it has been to impress upon the reader that although they are powerful statistical techniques, multivariate analyses provide results that are accessible to researchers and management alike. Rather than adding complexity, multivariate techniques clarify, simplify, and increase the actionability of any results a researcher can provide to his or her clients.