

functions, so that the utility functions can be used in an optimization model for segmentation, product design or pricing.

The motivation behind conjoint analysis is the following. First, asking some sample customers to directly map their part-worths (say, for price) may be meaningless as they are convolved with all the other attributes. As an alternative, we can ask respondents to compare a discrete number of profiles, but the number of such profiles can quickly grow large even for a small number of attributes and levels. For instance, if there are five attributes, each with five different possible levels, then the number of possible profiles is 5^5 , an immense number to test out in a survey. Even if many of these combinations can be eliminated as being unreasonable, we would still typically be left with too many profiles to test, since survey participants are unlikely to respond reliably to more than 5 to 10 rating questions at a time. To overcome this problem, conjoint surveys use experimental design techniques to construct an orthogonal subset of profiles for each respondent that is parsimonious yet ensures the results are statistically significant.

Next, even if presented a profile, most respondents are not able to give a utility value for each one, let alone break utilities down into part-worths. Rather, what a survey can meaningfully do is to ask respondents to compare one profile with another and rate which one they like better—or, given a set of profiles, pick the one they like best. The seminal work of Luce and Tukey [348] lays out the statistical methodology of extracting the part-worth measurements (or parameters of a hypothesized utility model) given only rankings data from a group of participants.

Current conjoint analysis software programs automate this analysis. A designer chooses a model and creates the relevant attributes and levels. The software then presents profiles to each survey participant and extracts part-worths based on statistical analysis of the resulting rankings data. The software is typically PC or Web-based and simulates a realistic choice environment by presenting graphics, images, or even videos.

Once the part-worth utilities have been extracted, they can be put to many uses. For example, the customer population can be segmented based on their part-worths (such as nonsmokers and exercise buffs for a hotel). One can also estimate the price sensitivity of each segment separately or design special marketing programs based on each segment's part-worths. A customer-behavior model can be fit using the utilities for various products under consideration, and their market shares and profitability can be estimated in a market-simulation model. Finally, product assortments can be designed for optimal positioning and overall profitability.