MarketVision RESEARCH®

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APPLICATIONS OF CONJOINT ANALYSIS

Conjoint analysis has been widely recognized as a powerful research tool. It is used to answer a large number of research questions in both consumer and business-to-business research. While conjoint analysis is not a panacea or cure-all, the several common variations of conjoint have each proven to be very useful in a number of very typical research situations. This document is intended to outline those situations when conjoint is an appropriate technique and how conjoint analysis can be used to aid strategic decision making. This document assumes a general familiarity with conjoint analysis and the terms encountered in a conjoint study. For those not familiar with conjoint, please see Conjoint Analysis: An Introduction, from MarketVision.

USES FOR CONJOINT ANALYSIS

Conjoint analysis is appropriate when a researcher wants to measure preference for a product or service, the source of that preference, or the impact on preference caused by product design changes. While there are a wide number of uses for conjoint analysis, four of the most common will be discussed below. They are:

- Product Design
- Market Segmentation
- Brand Equity
- Price Sensitivity

PRODUCT DESIGN RESEARCH

Product design research is the most common use of conjoint analysis among marketing researchers today. By knowing buyers' preference for various product features, as well as the design and production costs associated with those features, products can be designed that produce the strongest preference among buyers while still being profitable for the seller.

Let's consider an example using hypothetical utilities for an HMO. Assume that these utilities are identical for all individuals in the market. The utilities are shown on the next page.

PARTWORTH UTILITIES

Number of Physicians		Monthly Premium		Office Co-Pay		Provider	
Level	Utility	Level	Utility	Level	Utility	Level	Utility
250	0	$300	95	$300	80	Brand A	0
500	20	$500	75	$500	70	Brand B	20
750	35	$700	45	$700	50	Brand C	35
1250	65	$1200	0	$1200	0	Brand D	65

Number of Specialists		Number of Hospitals		Appointment and Scheduling	
Level	Utility	Level	Utility	Level	Utility
400	0	2	0	See Same Dr.	85
800	20	6	20	Dr./Panel of 3	65
1200	50	10	50	Dr./Panel of 8	290
1600	70	20	60	Dr./Panel of 18	0

In our example, Brand A offers the following product, and Brand B has a similar product.

CURRENT MARKET SCENARIO PRODUCT SPECIFICATIONS AND UTILITIES

	Product A		Product B	
Features	Specification	Utility	Specification	Utility
Number of Physicians	750	35	750	35
Number of Specialists	800	20	800	20
Number of Hospitals	10	50	10	50
Office Co-pay	$10	70	$10	70
Appointment & Scheduling	Panel of 8	20	Panel of 8	20
Provider	A	40	B	60
Monthly Premium	$200	75	$200	75
Total Utility		310		330
Share of Preference[1]		43%		57%

If we assume that each person will buy the product that has the highest total utility[2], then each person will choose Provider B. Even though the product specifications are identical, Provider B has a slightly higher preference (provider utility). To counteract the preference for B, Provider A could lower its price.

If A lowers its price from $200 to $100, the shares in the marketplace are equalized, as shown below:

SHARE EQUALIZING MARKET SCENARIO PRODUCT SPECIFICATIONS AND UTILITIES

	Product A		Product B	
Features	Specification	Utility	Specification	Utility
Number of Physicians	750	35	750	35
Number of Specialists	800	20	800	20
Number of Hospitals	10	50	10	50
Office Co-pay	$10	70	$10	70
Appointment & Scheduling	Panel of 8	20	Panel of 8	20
Provider	A	40	B	60
Monthly Premium	**$100**	**95**	$200	75
Total Utility		330		330
Share of Preference[1]		50%		50%

The reduction in price from $200 to $100 produces enough additional utility that the shares of preference are equalized. It is unlikely, though, that price reductions are the most profitable way to respond to competitive forces. Alternatively, Company A could conduct a sensitivity analysis to investigate the gains in preference brought about by various product configuration changes. First, let us evaluate the impact on shares of preference brought about by all possible product changes. The table below represents the impact of changing one level at a time to the specified level. All other product specifications remain unchanged from the first example.

MARKET SCENARIO ALTERNATIVE SPECIFICATIONS FOR PRODUCT A, CHANGING ONE FEATURE AT A TIME

	Change From	Change To	Change in Total Utility	New Total Utility	Change in Share of Preference	New Share of Prefernce
Number of Physicians	750	250	-35	275	-11%	32%
	750	500	-15	295	-4%	39%
	750	1250	+30	340	+10%	53%
Number of Specialists	800	400	-20	290	-6%	37%
	800	1200	+30	340	+10%	53%
	800	1600	+50	360	+17%	60%
Number of Hospitals	10	2	-50	260	-15%	28%
	10	6	-30	280	-9%	34%
	10	20	+10	320	+4%	47%
Monthly Premiums	$200	$100	+20	330	+7%	50%
	$200	$300	-30	280	-9%	34%
	$200	$400	-75	235	-21%	22%
Office Co-Pays	$10	$5	+10	320	+4%	47%
	$10	$15	-20	290	-6%	37%
	$10	$25	-70	240	-20%	23%
Appt. Scheduling	Panel of 8	Same Dr.	+65	375	+22%	65%
	Panel of 8	Panel of 3	+45	355	+15%	58%
	Panel of 8	Panel of 18	-20	290	-6%	37%

From the market's perspective, the single most beneficial change for Provider A is to revise the scheduling and appointment procedures so that patients always see the same doctor. Several other actions can also improve the market's preference for Provider A's product. Notice that reducing the monthly premium and office co-pay has beneficial effects but the effect is much smaller than the product improvements.

The previous analysis is somewhat misleading. While it considers the change in preference brought about by a product design change, it does not include the corresponding opposite change in preference resulting from a price change that might be necessary to revise the product. For example, to increase the number of physicians included in an HMO, the provider might have to charge a higher monthly premium; or to ensure that patients always see the same doctor; the office visit co-pay might have to be increased. Therefore, including the likely change in market price with the change in benefits can enhance our sensitivity analysis. A number of scenarios are shown on the following page.

MARKET SCENARIO ALTERNATIVE SPECIFICATIONS FOR PRODUCT A, CHANGING SEVERAL FEATURES AT A TIME

New Feature	Feature Change in Utility	Increase in Monthly Premium	Increase in Office Co-Pay	Change in Price Utility (Premium+ Co-Pay)	Total Change in Utility
Number of Physicians: 1250	+30	$50	$0	-15	+15
Number of Specialists: 1200	+30	$60	$0	-18	+12
Number of Specialists: 1200	+50	$100	$0	-30	+20
Number of Hospitals: 20	+10	$80	$0	-24	-14
Appt. Scheduling: Same Dr.	+65	$0	$15	-70	-5
Appt. Scheduling: Panel of 3	+45	$0	$5	-20	+25

This analysis would suggest that the market's preference for always seeing the same doctor is not matched by a willingness to pay for that benefit. Reducing the available doctor panel to three, however, offers the largest benefit when the costs of such changes are included in the analysis.

While these examples have been very simple, they show the power of using utilities derived from conjoint analysis in product design applications.

MARKET SEGMENTATION RESEARCH

In the previous product design examples, we assumed that all buyers' utilities were identical. Generally, this will not be the case. It is more likely that there will be groups of buyers that exhibit similar preference structures, but that not everyone will agree. Market segmentation research is a name applied to the process of identifying and explaining the meaningful differences between groups of buyers.

Conjoint analysis can be used two ways in segmentation research. First, results can be compared across segments that already exist, or a priori segments. Alternatively, the market segments can be identified from the data collected in the study itself. These segmentation schemes, referred to as post hoc or response-based schemes, tend to produce results with stronger relationships to actual behaviors, and are therefore of greater managerial relevance.

One approach to post hoc segmentation that has received significant attention is benefit, or needs-based, segmentation. The goal of benefit segmentation is to group consumers into segments that have similar preferences (or needs) for alternative product features (or benefits) but whose needs are different from other segments. For example, some buyers of telecommunication services might be most concerned about transmission quality while others might place more importance on price.

Conjoint analysis is frequently used to form benefit or needs-based segments. One standard output of conjoint analysis is relative attribute importance. Relative attribute importances communicate how much leverage a specific attribute will have in changing a particular buyer's preference for that product. Consider the following hypothetical attribute importances for four respondents.

The range can be used initially to identify the attributes that most discriminate between respondents. In this example those attributes are provider and price. Respondents One and Four are the most price sensitive while respondents Two and Three are more concerned about the provider as well as the service's reliability.

RELATIVE ATTRIBUTE IMPORTANCES BY RESPONDENT

	Total	One	Two	Three	Four
Carrier	14	12	15	20	7
Price	22	28	15	10	34
Transmission Quality	15	12	16	17	13
Reliability (Uptime)	16	13	20	20	11
Repair Responsiveness	10	10	8	11	11
Billing Accuracy	14	15	15	9	16
Integrated Local & Long Distance	16	10	11	13	8

It is important to note that the Total column doesn't look much like any one of the four respondents, and designing a product for the entire market is likely a flawed approach.

This simple example illustrates how attribute importances from conjoint can be used to construct market segments.

One additional note is in order regarding using attribute importances to form market segments. Attribute importances are derived from the utilities of the most preferred and least preferred levels of an attribute. For the attribute importance to have a similar interpretation for all respondents, the respondents must agree on the rank order of the levels within the attribute. That is, respondents would agree that, other things being equal, a price of $10 is better than $20, and both are better than a price of $50. For attributes like brand or color, an ordinal relationship isn't assured. One respondent could legitimately prefer AT&T over Sprint while another could prefer Sprint. In the case of nominal attributes, clustering on rescaled utilities is frequently the approach of choice.

Given this segment level approach, the company can examine its product portfolio along with the needs of each segment to identify the best current targets and the segments that represent the best market opportunity.

BRAND EQUITY RESEARCH

We have seen in previous examples how conjoint analysis can be used to better understand the market's preference for specific brands. In the HMO example, we identified the market's willingness to pay a premium for an identical plan from a specific provider. In the segmentation example, we see respondent Three placing great importance on carrier while respondent Four didn't differentiat between carriers much at all. These are two examples of how conjoint can be used in brand equity research. While there are many ideas about exactly what brand equity is, the discussions tend to revolve around a) economic value that b) biases consumer choice. Simply stated, brand equity is the power of certain brands to:

Charge more money than their competitors and still be purchased,

OR

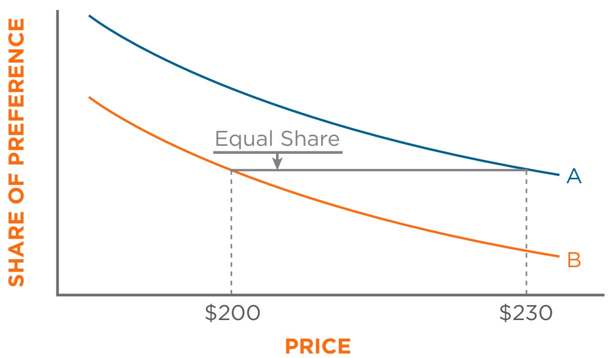
Realize incremental market share while maintaining competitive pricing.

Initially, let's consider brand equity from the perspective of dollars of premium necessary to equalize market share. For instance, consider the following two brands' demand curves.

Demand curves such as this are frequently produced from discrete choice modeling, either through simulation results or by analyzing conditional choice probabilities.

The bold horizontal line represents one market scenario where both brands have identical shares of preference. However, notice that Brand A can charge approximately $30 over Brand B's price and still have the same share. We can calculate this dollar value using utilities as well. Assume two segments have the following average utilities for brand and price.

EQUALIZING MARKET SHARE



		Total	One
	Brand A	45	Brand A
	Brand B	35	Brand B
	Brand C	0	Brand C
	$100	115	$100
	$100	90	$100
	$100	55	$100
	$400	0	$400
Realative Attribute	Importance	–	–
	Brand	28%	52%
	Price	72%	48%

Initially, we can make the following brand related conclusions.

- Both segments agree that C is the least preferred brand
- Segment 1 most prefers Brand A
- Segment 2 most prefers Brand B
- Segment 2 is more brand sensitive, while Segment 1 is more price sensitive

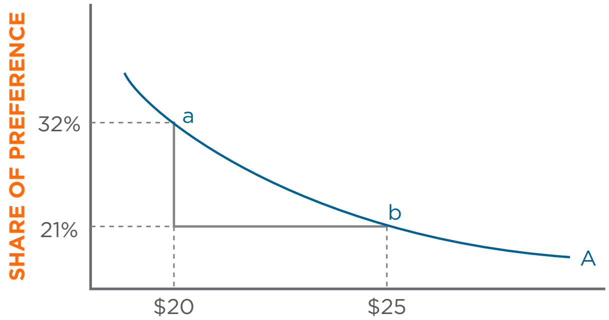
Assuming that we are Brand A and that Brand B is priced at $200 dollars, what price can we charge for share equalization among Segment 1 members? Realize that the difference in brand utilities is 10 utiles (45-35). We also know that since our preference is higher among Segment 1 we can charge a price above $200. The price we can charge for share equalization is not as high as $300 because that would represent a change of 35 utiles. We only wanted to account for 10 utiles of preference. Therefore, $100 represents 35 utiles or $2.857/utile. So our 10 utile difference is worth $28.57. If Brand B is priced at $200, Brand A can charge $228.57 and the two brands will have equal share among Segment 1 buyers. In this way, the value of brands can be identified and tracked. Notice, however, that brand A must sell at a discount to brand B to equalize share among segment 2.

It should be pointed out that pricing for share equalization is probably not justified in most situations. This metric is simply recommended as a powerful tool for tracking brand strength vis-à-vis competition.

PRICE SENSITIVITY RESEARCH

Similarly, conjoint methods can be used to measure the market's price sensitivity towards a brand. Price sensitivity is most frequently measured with price elasticity of demand. Price elasticity is defined as the percent change in demand divided by the percent change in price. Price elasticities are generally negative. Elasticities between 0 and -1 are termed inelastic and represent markets that are not price sensitive. Elasticities less than -1 indicate price sensitive, or elastic, markets.

Price elasticity can be shown graphically as follows:



For example, assume that when priced at $20 Brand A has a 32% share of preference. Assume that Brand A increases its price to $25, a 25% increase ((25-20)/20 = 0.25), and the share decreases to 21%, a 34% decrease ((21-32)/32 = 0.34375). Therefore, the elasticity of this product is -1.375 (-0.34375 / 0.2500). Since the number is less than -1, this represents a price sensitive market. The interpretation and communication of elasticities is sometimes difficult, but they basically communicate whether the change in volume is enough to offset the change in price. Here we have a price sensitive market, so we would conclude that the extra $5 per unit of revenue would not offset the decrease in units sold. One way to show this relationship is through relative revenue. Let's assume that this market is a constant 100 units per time period. By increasing our price, we go from $20 to $25 per unit but we go from 32 units to 21 units. Therefore, the revenue at the $20 price is $640 (32*20) versus $525 at the $25 price (25*21).

Conjoint analysis has proven useful in a wide variety of circumstances. This document has outlined four of the most common applications, but many others exist.

[1]The shares of preference reported in this section are derived from a probablistic (BTL) choice model. Probablistic shares of preference resemble but are different from market shares. They will approximate market shares if a set of assumptions is met, such as equal awareness, distribution, and promotion of products as well as informed consumers. Specifically, the shares represent the exponentiation of one seventy-fifth of the reported utility percentaged against the competitive product treated similarly.

[2]This "first choice" rule is the most simple decision simulation. This model has been criticized in the literature, but is useful for the purposes of this example.