W5 on Conjoint Analysis

Conjoint analysis, also known as “trade-off” analysis, has become the primary tool in the marketing researcher’s arsenal for designing and pricing products and services. With approximately 15,000 conjoint studies conducted worldwide annually, it is imperative that organizations have an understanding of conjoint analysis in an effort to monitor consumer preferences, design better products and services, and establish optimal price points.

This whitepaper is designed to explain the conjoint methodology, as well as illustrate the benefits of a properly designed conjoint survey.

What is Conjoint Analysis?

Conjoint analysis is a set of statistical tools used by market researchers to assess the value consumers place on products and their specific features or attributes. The ultimate goal of conjoint analysis is to quantify each product attribute (and the various attribute options) to assist in the development of better products and a more sound pricing strategy. The ultimate product yielded by conjoint analysis is a market simulator that can assist marketers, researchers, and/or managers in understanding the implications of new products, line extensions, product modifications, and price changes in the competitive marketplace.

Figure 1. Conceptual Image of Conjoint Analysis
**Why Use Conjoint Analysis?**

Research participants have historically been asked to consider a set of product attributes, and to individually assess the importance of each attribute using scalar measures (e.g., 5-pt., 7-pt. Likert scales). However, this methodology is wrought with shortcomings, including scale bias, respondent acquiescence, and extreme response patterns. With so many potential sources of bias, it is often difficult, if not impossible, to use self-explicated data to effectively design products. Further, as these attributes are considered individually, and not in concert, it becomes quite challenging to understand which attributes are most important in a relative sense. Conclusions drawn from this methodology can often be presumptive at best or totally incorrect at worst.

Fortunately, advances in marketing science have yielded an alternative methodology that yields high level information at an affordable cost: **conjoint analysis**. Conjoint analysis mimics the purchasing experience, asking respondents to evaluate products (both actual and hypothetical) based on their product profiles. Rather than asking respondents to rate a battery of attributes (as with traditional research methodologies), respondents reveal their preferences by choosing product concepts by way of a series of conjoint exercises. Using these revealed preferences, the attributes that impact consumer demand can be extrapolated, allowing for both product and price optimization.

**How is Conjoint Research Conducted?**

While specific research objectives will dictate the direction of conjoint research, there are several components that are common to all conjoint engagements (see Figure 2 below). These steps include: definition of attributes; establishment of attribute levels; choice of conjoint methodology; design of experiment; data collection; data analysis; and development of the market simulator.

**Hypothetical Case Study – Energy Bar Choice-Based Conjoint**

To demonstrate the seven steps of developing and conducting a conjoint engagement, we will consider the example of a national food manufacturer, specializing in the production energy bars and nutritional food products, who is interested in developing an energy bar that will appeal to a majority of energy bar consumers. They are interested in understanding preferred nutritional content, flavor, and price. Using a choice-based conjoint methodology will allow the company to understand the trade-offs consumers are willing to make between these variables.
**Step 1: Definition of Attributes**

To replicate the decision-making process, it is necessary to understand each of the attributes consumers consider when making an actual purchasing decision. Experience, previous research, and/or the specific objectives of the research will determine which attributes are of particular importance, and whether all product features should be displayed or only those most relevant to differentiating a product from competitive offerings.

It is of utmost importance the list of attributes tested be carefully developed to ensure an optimal balance broad enough to allow products in the marketplace to be reasonably defined (failure to include vital pieces of information would result in inaccurate market predictions). However, the list of attributes must be short enough to avoid respondent fatigue due to information overload (which would call into question the validity of research findings).

Through extensive knowledge of the category as well as previous qualitative research, the national energy bar producer understands that consumers most often take into consideration brand, protein and carbohydrate levels, flavor, and price when considering purchase of energy bars. Further, they also understand consumers are less interested in levels of magnesium, zinc, selenium, etc. Therefore, a reasonable set of attributes would include brand, protein, carbohydrates, flavor, and price, while excluding extraneous variables.

**Step 2: Establishment of Attribute Levels**

Once attributes for the conjoint research have been defined, it must be determined how attributes will vary from one product concept to the next. This step involves the establishment of attribute levels. Attribute levels must be comprehensive enough to capture all of the products that exist or will soon exist within the marketplace. However, as with the definition of attributes, care must be taken to avoid respondent fatigue, and so only the most prevalent attribute levels will be chosen for testing (typically 3-5 attribute levels per attribute). Further, the number of attribute levels chosen has a direct impact on the number of concepts respondents will be asked to evaluate. The optimal number of attribute levels tested will be that which ensures research objectives are satisfied while minimizing the burden faced by respondents.

An example of the attributes and attribute levels that might be included in a conjoint analysis for energy bars is displayed in Figure 3.

**Figure 3: Example of Concept Attributes and Attributes Levels**

<table>
<thead>
<tr>
<th></th>
<th>Brand</th>
<th>Protein</th>
<th>Carbs</th>
<th>Flavor</th>
<th>Organic</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store</td>
<td>0 grams</td>
<td>0 grams</td>
<td>Chocolate</td>
<td>Organic</td>
<td>$2.00</td>
<td></td>
</tr>
<tr>
<td>National</td>
<td>10 grams</td>
<td>10 grams</td>
<td>Apple</td>
<td>Non-organic</td>
<td>$2.50</td>
<td></td>
</tr>
<tr>
<td>Premium</td>
<td>20 grams</td>
<td>20 grams</td>
<td>Banana</td>
<td></td>
<td>$3.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30 grams</td>
<td>30 grams</td>
<td>Peanut butter</td>
<td></td>
<td>$3.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40 grams</td>
<td>40 grams</td>
<td></td>
<td></td>
<td>$4.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 grams</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Step 3: Choice of Conjoint Methodology

Because no two product and/or service categories are exactly the same, there are a number of conjoint methodologies at the disposal of market researchers. The three primary methods used today include: conjoint value analysis (CVA), adaptive conjoint analysis (ACA), and choice-based conjoint analysis (CBC), with adaptive choice-based conjoint (ACBC) emerging as a new generation of conjoint analysis. For the purposes of this whitepaper, we will focus on CBC analysis, by far the most popular conjoint methodology currently used by researchers.

When consumers purchase products and/or services, they very rarely evaluate the attributes and attribute levels of a single product, and decide to walk away if that product is thought to be unsatisfactory. More often consumers evaluate a number of alternatives and choose what best fits their needs and budget. While scalar ratings often suggest that consumers demand products and/or services with the highest quality attributes at the lowest price, in actuality, trade-offs are made between quality and price. Choice-based conjoint has experienced significant growth in the past decade as researchers have been able to more accurately simulate this very experience (the reason CBC is sometimes referred to as discrete choice analysis).

The primary benefit of CBC is that the data yielded from research reflects consumer choices, not preferences. While consumers can indicate preference for a number of products and attributes in an online survey environment, in the real world they often end up choosing one product over another, or even choosing none of the options available, choosing instead to opt out of the purchase altogether. Therefore, measuring consumer preference in an online survey can often result in faulty prediction of consumer choice in the marketplace. The most effective way of predicting consumer choice in the marketplace is to simulate the decision-making process in an online survey setting. CBC accomplishes just that, as illustrated in Figure 4 below.

Figure 4. Example of Choice-Based Conjoint (CBC) Task

<table>
<thead>
<tr>
<th>Energy Bar Attribute</th>
<th>Energy Bar 1</th>
<th>Energy Bar 2</th>
<th>Energy Bar 3</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand</td>
<td>National</td>
<td>Store</td>
<td>Premium</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>20 grams</td>
<td>30 grams</td>
<td>10 grams</td>
<td></td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>20 grams</td>
<td>50 grams</td>
<td>40 grams</td>
<td>None of these</td>
</tr>
<tr>
<td>Flavor</td>
<td>Chocolate</td>
<td>Apple</td>
<td>Peanut Butter</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>$2.00</td>
<td>$1.50</td>
<td>$2.50</td>
<td></td>
</tr>
<tr>
<td>Which of these energy bars would you choose?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

Step 4: Design of Experiment

Having established the methodology, attributes, and attribute levels to be tested, W5 can then create concept profiles (i.e., descriptions of product concepts using the attributes and attribute levels to be used in the research). Respondents are asked to evaluate a number of these concepts, and in the case of CBC determine which, if any, they would choose to purchase given the opportunity. Fortunately, it is not necessary that every potential product offering be evaluated. In fact, this would be quite impossible, as there are typically thousands of potential product configurations in any given study. For example, there are 1800 hypothetical products in the energy bar study (3 brands x 5 protein levels x 6 carbohydrate levels x 4 flavors x 5

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price levels). However, with a carefully constructed conjoint design, W5 is able to calculate respondent preference for each attribute and attribute level. Therefore, assuming a simple additive model (i.e., product preference is the sum of preference for its attributes), W5 can estimate how respondents would react to any product offering.

Unlike traditional research methodologies where all respondents complete the same survey, conjoint methodology utilizes many versions of the survey (see Figure 5). By offering unique tasks to each respondent, researchers are able to test a far greater number of concepts, and reduce potential bias that may occur due to respondent behavior or experiment design.

**Step 5: Data Collection**

An online survey is recommended for almost all conjoint research engagements, as it provides the most effective, cost efficient, time sensitive, and high quality solution. Respondents are required to consider a great deal of information, allowing them to visually assess the stimuli results in more reliable findings. An online presentation of product concepts and conjoint tasks allows respondents to complete the survey at their own pace, allowing time for thoughtful and accurate responses. With over 70% of U.S. adults accessing the Internet via computers at home, work, or school (Source: Pew Internet and American Life Project), an online methodology allows for data collection from a large sample set.

While sample sizes for traditional research methodologies are typically established to achieve a specific margin of error (e.g., N=400 to yield a margin of error of +/- 4.9% at the 95% significance level), W5 utilizes a different set of criteria when recommending sample sizes for conjoint studies. The recommended sample size for each engagement is largely determined by the number of attributes, attribute levels, concepts, and tasks to be performed by the respondent. As such, there is no standard sample size when conducting conjoint analysis. Rather, W5 must work with the client to determine what sample size will be needed on a case-by-case basis.

**Step 6: Data Analysis**

With a carefully constructed conjoint survey, W5 can statistically deduce the consumer values for each feature respondents may be subconsciously using to evaluate concepts. Analysis of conjoint data yields a series of scores for each respondent for each attribute level. These scores, known as part-worths, may be likened to the utility which is an arbitrary measurement of utility consumers associate with a product and its attributes. Each score reflects the value the respondent associates with each attribute level, and is the building block from which all analysis is conducted. By assuming a simple additive model, W5 is able to build products and pricing structures, and then calculate the value consumers find in that product. By comparing this to other potential products in the marketplace, we can begin to understand how consumers will choose products in the real world.
However, part-worths are not the only statistics of importance revealed during data analysis. Other important statistics may include attribute importances (i.e., the importance of each attribute in relation to other attributes), counts (the number of times an attribute level is selected relative to the number of times it is shown), and perhaps most importantly, share of preference. Whereas part-worths are often difficult to interpret due to their arbitrary scale, share of preference reveals insight into how consumers prefer products against one another.

**Step 7: Development of Market Simulator**

While preliminary analysis of conjoint data results in valuable insight regarding consumers and their preferences, the real value of conjoint analysis comes from the market simulators (see Figure 6 below) developed at the conclusion of the research engagement. The market simulator is a software program, similar to a spreadsheet, which allows users to conduct what-if analyses with data collected during conjoint fielding. As mentioned above, respondents can be asked to evaluate only a small fraction of concept profiles, yet still reveal how they would respond to any product offering. Therefore, it is possible to aggregate the preferences of all consumers to reveal how the market as a whole will respond to any product offering. Further, W5 can assess how the marketplace will respond to two or more competing products by calculating the market’s share of preference for every product of interest.

W5 can then vary the features of each product and observe how share of preference changes, holding market conditions constant. In essence, clients can estimate the results of innumerable product concepts based on data collection in a single survey (a much more efficient alternative to focus groups and test markets).
Understanding the relative importance of each of the energy bar attributes, W5 is able to determine how potential product configurations will perform in terms of market preference. W5 would define the current landscape of the energy bar market by setting specifications for all competing products (including client products that are already available on the market). Proposed products would then be tested within the existing landscape to understand consumer response to such a product's introduction. Analysis of consumer preference shifts would determine to what extent new or re-configured products may impact the market for that product. W5 would be able to determine not only the share of preference of the proposed product, but also from which products that preference is transferred. This ability is especially important when trying to avoid the cannibalization of other products' market share within the client's current energy bar portfolio.

**How is Conjoint Analysis Used?**

**Product Design**

The use of the market simulator provides insight into the consumer mindset that can be invaluable to companies when designing new products. It allows for an understanding of the current marketplace as well as an assessment of the impact a new product may have on consumer preferences within that marketplace. By understanding which attributes are most important to consumers and what levels of that attribute are preferred, product concepts and their attributes can be fine-tuned to maximize the share of preference a product would likely hold if introduced.

However, share of preference must not be mistaken for market share. While conjoint analysis is able to capture a great deal of information about consumer preferences, it does not capture the potential effects of exogenous factors like product distribution, advertising, or unique product features that are introduced after the research has been conducted. The market simulator works off of the assumption that all products have similar positions within the market, and only calculates consumer preference for one product relative to others using the attributes tested.
Pricing Research

Conjoint analysis serves not only as a powerful tool for the development of products and services, but also in pricing those products and/or services. The ability to assess the marketplace and establish acceptable price points is often more important than developing product, since even an ideal product at the wrong price point is likely to dissuade consumer purchase.

Conjoint analysis allows W5 the ability to calculate market demand curves (see Figure 7), which provide crucial information in pricing strategy. By developing an understanding of the price sensitivities of consumers and mapping those with a firm’s cost structure, the optimal price (or equilibrium) can be established and the product can be priced at a rate acceptable to the market.

![Figure 7. Example of Demand Curve Analysis for Energy Bar Market](image)

The calculated demand curves provide feedback like few other price measurements can. While other methodologies are subject to changes in market forces, conjoint analysis holds these external factors constant. So long as there are no dramatic changes in the structure of the market, the validity of these measurements is maintained. However, should there be changes (either seen or unseen) within the market, follow-up waves of research can be conducted to assess the impact these changes have on consumer demand. For more on tracking research, please see W5’s whitepaper, W5 on Strategic Tracking Research (www.w5insight.com/wp-tracking.shtml).

Brand Equity Measurement

Conjoint analysis can also be used to measure brand equity, which is an especially critical issue for many companies today as products become differentiated more by the inherent brand than by product attributes. Choice-based conjoint analysis offers a reliable way to measure brand equity. As each brand is presented at various prices throughout the survey (the same as any other product attribute), respondents reveal their preference and price sensitivity to each brand individually.
Upon completion of analysis, W5 is able to determine the price premium (or discount) each brand within the study demands. While this will not provide a complete picture of a brand’s image within the marketplace, understanding consumer preference, consideration, and importance for the brand can supplement research that assesses other brand characteristics (e.g., awareness, familiarity, perceptions, etc.).

**Figure 8. Conceptual Framework for Understanding Energy Bar Brand Image**

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**Final Thoughts on Conjoint Analysis**

Conjoint analysis is one of the most rapidly growing market research techniques used today, and has provided companies with a cost-effective and timely solution that yields results used in the design and pricing of products and/or services. With conjoint analysis, W5 meets clients’ objectives with useful results that are easy to embrace and understand and that offer strategic guidance in the product development process.

Consumers use many criteria when selecting products and/or services. As companies have shifted the focus of product development to customization for specific target consumers, the number of attributes has increased considerably. With so many alternative configurations, it can be difficult to ascertain what consumers truly value and how they evaluate different offerings during the decision-making process.

Even though some of the underpinnings of conjoint analysis can be difficult to understand, many companies today realize the importance of realistic research results. Only by placing the consumer within an environment that closely mimics the actual purchasing experience can such results be achieved.

More and more companies are choosing to engage in conjoint research, and in doing so, are gaining a competitive advantage over their competitors who have yet to embrace conjoint as a tool for developing and pricing their products.
**Frequently Asked Questions**

1. **What are the benefits of working with W5 for conjoint analysis research?**

   W5 possesses a wealth of experience developing and designing relevant, actionable, and valid conjoint solutions for our clients. Unlike many other marketing research firms, W5 does not subscribe to the idea that a client’s needs can be met with a “standard” conjoint survey instrument. As such, we work closely with our client to design a conjoint study to meet their specific needs and objectives.

   Conjoint analysis is a complex methodology that requires specialized knowledge of Bayesian statistics, matrix manipulation, and valid conjoint instrument design. However, W5 understands that gaps exist between the foundations of conjoint analysis and the overall objectives of many clients. W5 serves as a partner that translates these foundations into realistic and actionable models that can be used to guide product strategy.

2. **Is conjoint analysis appropriate for my research needs?**

   W5 reviews the objectives of each engagement to determine whether a conjoint study is the appropriate methodology. While insight gained from conjoint analysis answers many questions about product preference, price sensitivity, and brand loyalty with a high level of validity, conjoint analysis is a complex methodology that requires a great deal of thought and consideration on the part of respondents. When presented with numerous product attributes, prices, and brands, respondents often choose to focus on a smaller sub-set of the attributes most important to them, while diverting attention from attributes that may be of greater interest to the client.

   For engagements where there is interest in a specific objective (e.g., assessing brand equity), W5 will often recommend a methodology that enables a design that requires respondents to focus on that specific attribute rather than a sub-set of their choosing.

3. **Will conjoint market simulators predict my products’ market share?**

   At the conclusion of a conjoint engagement, W5 provides the client with a market simulator, developed using Sawtooth Software (http://www.sawtoothsoftware.com). The simulator is a stand-alone software package that allows clients to conduct alternative “what-if” scenarios. The market simulator is an effective tool for analyzing consumer preference for different product configurations among a competitive set. By fine-tuning individual product attributes and product price points, W5 clients are able to gain an understanding as to whether product preference will increase or decrease.

   While the market simulator is an effective tool for analyzing preference, establishing a product’s market share often requires greater information than available within the simulator. Advertising, product distribution and availability, and other external factors all drive a product’s realized market share; such exogenous influences are not accounted for within the market simulator.

   Therefore, the market simulator should be viewed as a tool for analyzing directional shifts in preference rather than an accurate predictor of market share.

**Want to Know More?**

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