Conjoint Analysis

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Introduction

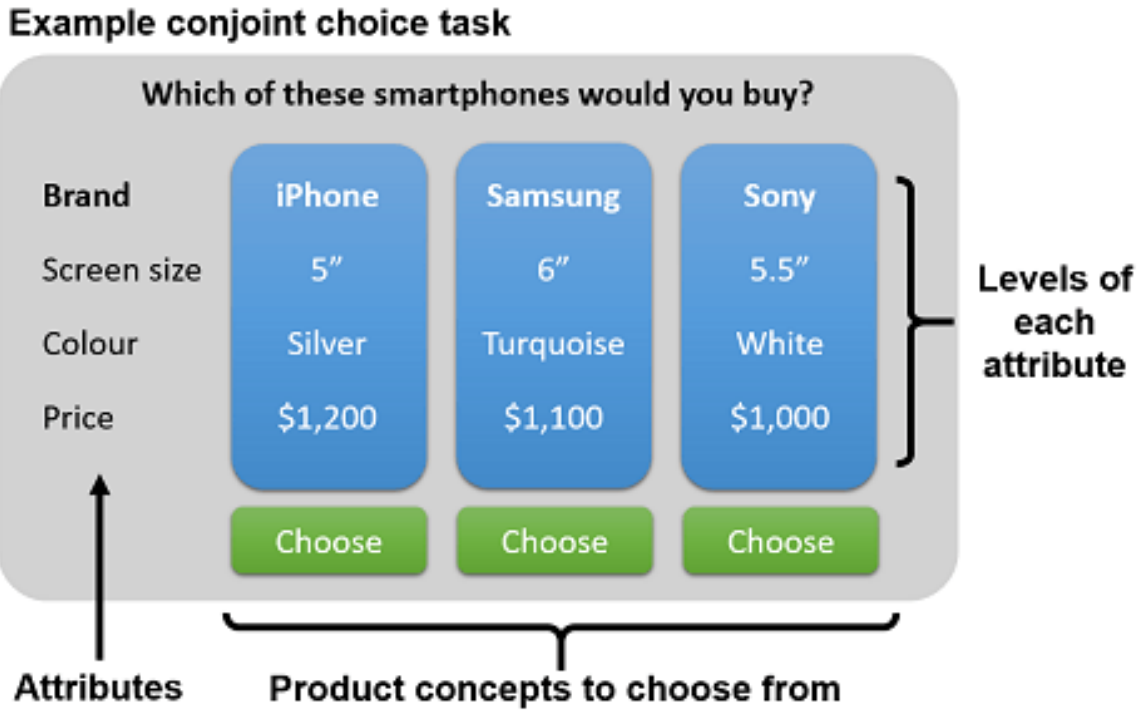
The Conjoint Measurement Analysis is a method for attributing utilities to the components (part worths) on the basis of ranks given to different outcomes (stimuli) of the product.

- Conjoint analysis is a popular method of product and pricing research that uncovers consumers' preferences and uses that information to help select product features, assess sensitivity to price, forecast market shares, and predict adoption of new products or services.
- Conjoint analysis is frequently used across different industries for all types of products, such as consumer goods, electrical goods, life insurance plans, retirement housing, luxury goods, and air travel.
- It is applicable in various instances that centre around discovering what type of product consumers are likely to buy and what consumers value the most (and least) about a product

Procedure

Conjoint analysis works by breaking a product or service down into its components (referred to as attributes and levels) and then testing different combinations of these components to identify consumer preferences.

For example, consider a conjoint study on smartphones. The smartphone is sorted into four attributes which are further broken down into different variations to create levels:



Terminology

- **Factor** : Independent variable the researcher manipulates that represents a specific attribute. In conjoint analysis, the factors are nonmetric. Factors must be represented by two or more values (known as levels), which are also specified by the researcher.
- **Level** : Specific nonmetric value describing a factor. Each factor must be represented by two or more levels, but the number of levels typically never exceeds four or five. If the factor is originally metric, it must be reduced to a small number of nonmetric levels.
- **Concept** : Combining all your attributes and levels, which creates a hypothetical product, is called a concept. Concepts are sometimes referred to as “cards" in statistical software.

- **Profile**: By taking one level from each factor, the researcher creates a specific “object" (also known as a treatment) that can be evaluated by respondents. For example, if a soft drink was being defined by three factors, each with two levels (diet versus regular, cola versus non-cola, and caffeine-free or not), then a profile would be one of the combinations with levels from each factor
- There can be as many profiles as there are unique combinations of levels. One method of defining profiles is the *factorial design*, which creates a separate profile for each combination of all levels. However, in many conjoint analyses, the total number of combinations is too large for a respondent to evaluate them all. In these instances, some subsets of profiles are created according to a systematic plan, most often a *fractional factorial design*.

- **Full-profile method** : Method of gathering respondent evaluations by presenting profiles that are described in terms of all factors. For example, let us assume that a candy was described by three factors with two levels each: price (15 cents or 25 cents), flavor (citrus or butterscotch), and color (white or red). A full profile would be defined by one level of each factor. One such profile would be a red butterscotch candy costing 15 cents.
- **Utility** : An individual's subjective preference judgment representing the holistic value or worth of a specific object. Utility encompasses all features of the object, both tangible and intangible, and as such is a measure of an individual's overall preference. Utility is assumed to be based on the value placed on each of the levels of the attributes. In doing so, respondents react to varying combinations of attribute levels (e.g., different prices, features, or brands) with varying levels of preference. Utility is expressed by a relationship reflecting the manner in which the utility is formulated for any combination of attributes.

- **Part-worth** : The utility, which represents the total worth or overall preference of an object, can be thought of as the sum of what the product parts are worth, or part-worths. The *general form of a conjoint model* can be shown as

$$\begin{aligned}(\text{Total worth for product})_{ij} \ldots n_{ij} = {} & \text{Part worth of level } i \text{ for factor 1} \\ & + \text{Part worth of level } j \text{ for factor 2} + \cdots \\ & + \text{Part worth of level } n \text{ for factor } m\end{aligned}$$

  where the product or service has m attributes, each having n levels.

- **Additive model** : Model based on the additive composition rule, which assumes that individuals just “add up" the part-worths to calculate an overall or total worth score indicating utility or preference.

An Example

Assume that HBAT is trying to develop a new industrial cleanser. After discussions with sales representatives and focus groups, management decides that three attributes are important: cleaning ingredients, form, and brand name.

	Levels	
Factor	*1*	*2*
1. Ingredients	Phosphate-Free	Phosphate-Based
2. Form	Liquid	Powder
3. Brand Name	HBAT	Generic Brand

A profile of a hypothetical cleaning product can be constructed by selecting one level of each attribute. For the three attributes (factors) with two values (levels), eight ($2 \times 2 \times 2$) combinations can be formed.

- Profile 1: HBAT phosphate-free powder
- Profile 2: Generic phosphate-based liquid
- Profile 3: Generic phosphate-free liquid

An Example

TABLE 1 **Profile Descriptions and Respondent Rankings for Conjoint Analysis of Industrial Cleanser Example**

	PROFILE DESCRIPTIONS				
	Levels of:			*Respondent Rankings*	
Profile #	**Form**	**Ingredients**	**Brand**	**Respondent 1**	**Respondent 2**
1	Liquid	Phosphate-free	HBAT	1	1
2	Liquid	Phosphate-free	Generic	2	2
3	Liquid	Phosphate-based	HBAT	5	3
4	Liquid	Phosphate-based	Generic	6	4
5	Powder	Phosphate-free	HBAT	3	7
6	Powder	Phosphate-free	Generic	4	5
7	Powder	Phosphate-based	HBAT	7	8
8	Powder	Phosphate-based	Generic	8	6

Note: The eight profiles represent all combinations of the three attributes, each with two levels ($2 \times 2 \times 2$).

$$\begin{aligned}\text{Utility} = &\text{ Part-worth of HBAT brand}\\ &+ \text{Part-worth of phosphate-free cleaning ingredient}\\ &+ \text{Part-worth of powder}\end{aligned}$$