Conjoint Overview

What is Conjoint Analysis?

Conjoint analysis is one of the terms used to describe a broad range of techniques for estimating the value people place on the attributes or features that define a product and service.

What does it tell you?

- The goal of any conjoint survey is to assign specific values to the range of options buyers consider when making a purchase decision
- Armed with this knowledge, marketers can focus on the most important features of products or services and design products/services and messages most likely to strike a cord with target buyers
- Conjoint analysis is perfect for answering questions such as:
  - "Which should we do, build in more features, or bring our prices down?“
  - "Which of these changes will hurt our competitors most?“

Why use conjoint?

- Conjoint analysis evaluates product/service attributes in a way that no other method can
  - Traditional surveys: ask respondents to estimate how much value they place on each attribute (stated importance)
  - Conjoint analysis: break the task into a series of choices or ratings allowing computation of the relative importance of each of the attributes (derived importance)

Why use conjoint?

- Another advantage of conjoint analysis is the ability to use the results to develop market simulation models that can be used into the future
  - Traditional research approaches: every time a change takes place in the market, a new survey is needed
  - Conjoint analysis: changes in the product or market can be incorporated into the simulation model to generate predictions of how buyers will respond to the changes

Planning: Dependent Variable(s)

- Identify “DV” (management objectives -- what is being predicted in test) (e.g. in marketing, penetration, sales, purchase intent, market share, etc.)
  - Given cost data **profitability** can also be a DV
- How is the DV selected? Brainstorming
  - By people in different positions:

    Users

    Production folks

    R & D

    Marketing

    “Relevant others”

How is the Data Analyzed?

- There are a variety of standard statistical methods used in conjoint analysis to translate respondents' answers into importance values or utilities
  - Ordinary least squares regression
  - Weighted least squares regression

- Regardless of the statistical methodologies used, conjoint analysis results have withstood intense scrutiny from both academics and professional researchers over the past 25 years

How is the Data Analyzed?

- The actual values obtained by these statistical methods are useful, however the relative values or relationships between each of the attributes are of more importance.
  - Evaluate respondents' answers in a manner that reveals the underlying value they consciously or subconsciously place on each attribute.
  - Conjoint analysis allows us to compute the relative value of all options considered in the research design.

Price Sensitivity Analyses

- Conjoint analysis can be used to measure individuals' sensitivity to brand names, prices, and all other attributes in the research design.
  - The utilities for each price level offer one measure of market sensitivity to variations in price.
  - interactions between price and other attributes can also measure how price sensitivity may vary with respect to brand name and other attributes.
  - Simulations can be run at various price points to estimate changes in yours or your competitor's prices on the marketplace.

Actual Output – Technology Company

The utility values tell you how much each level impacts intent to purchase

```
SUBJECT NAME:  2500+ backup

Importance   Utility(s.e.)  Factor

+---------+                 BACKUP     BACKUP EMAIL
|54.04    |   .3061( .    )     |--      yes @99.9% uptime
+---------+   .1827( .    )     |-       yes @99.99% uptime
          |   .2090( .    )     |-       yes @99.999% uptime
          |  -.6978( .    ) ----|        no
          |
          |                 INDNSRT    INTELL DNS ROUTING
 2.28     |  -.0212( .    )     |        YES
          |   .0212( .    )     |        NO
          |
         ++                 EMSCREEN   EMAIL SCREENING
 4.00    ||  -.0372( .    )     |        YES
         ++   .0372( .    )     |        NO
          |
       +--+                 ANALYT     ANALYTICS
17.45  |  |   .1621( .    )     |-       YES
       +--+  -.1621( .    )    -|        NO
          |
      +---+                 CUSTSVC    CUSTOMER SERVICE
22.22 |   |  -.2064( .    )    -|        bus hrs only
      +---+   .2064( .    )     |-       24/7 email/phone
          |
             3.7089( .    ) CONSTANT
```

Factor

Levels

Other factors and levels

Overall awareness to trial of the Core Concept – Management's best guess of most realistic scenario

The importance factor tells you the overall importance of the factor in driving purchase intent

An Example

- An airplane ticket:
  - $400 or $700 for a ticket
  - Seat size regular or extra-wide
  - Direct flight (3hrs) indirect flight (5hrs)

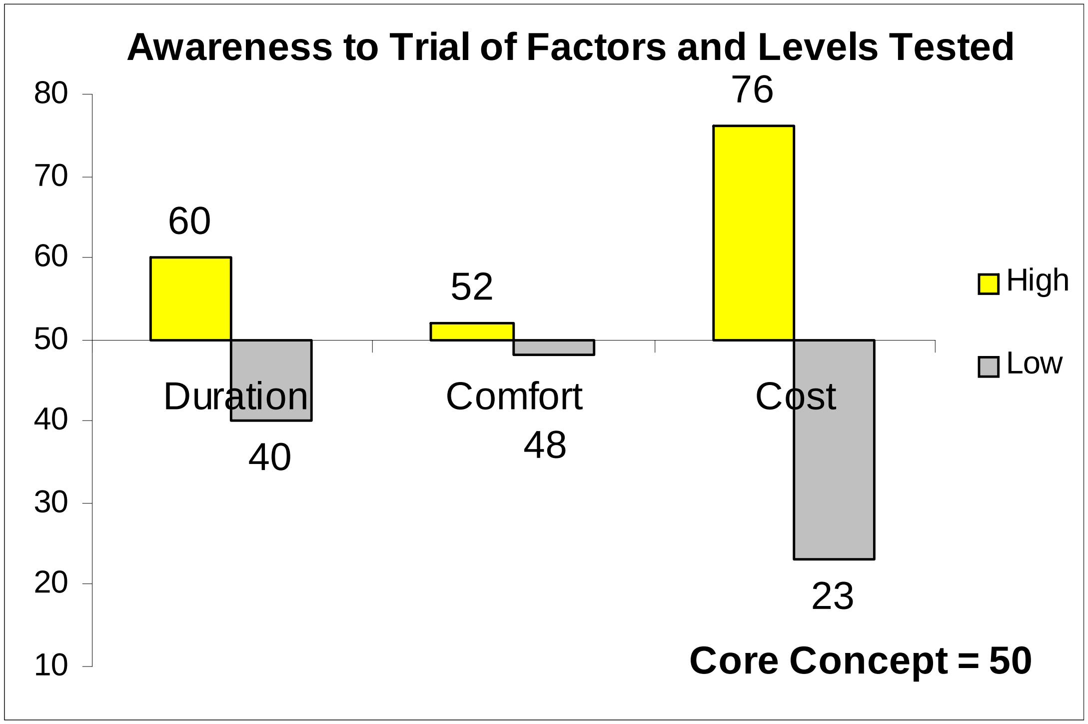
An Example

- Based on these **3** factors there are **8** possible ticket configurations that could be tested. (2 x 2 x 2)

Choice	Seat Comfort	Price	Duration
1	extra-wide	$700	5 hours
2	extra-wide	$700	3 hours
3	extra-wide	$400	5 hours
4	extra-wide	$400	3 hours
5 (CORE)	regular	$700	5 hours
6	regular	$700	3 hours
7	regular	$400	5 hours
8	regular	$400	3 hours

An Example

- In evaluating products, consumers will always make trade-offs based on the values they assign different features. We use a measure called awareness to trial to measure this.
  - Awareness to trial: a number which represents the average rate at which a respondent is going to try a product or service given 100% awareness and comprehension.



An Example

- This consumer places a greater value on a 3 hour flight (awareness to trial is 60) than on a 5 hour flight (A to T is 40).
- This consumer does not differ much in the value that he or she places on comfort. That is, the utilities are quite close (52 vs. 48).
- This consumer places a much higher value on a price of $400 than a price of $700 (76 vs. 23).
- Average A to T can be calculated for all consumers or for specific subgroups of consumers.

An Example

- These trail A to T rates also tell us the extent to which each of these attributes drives the decision to choose a particular flight. The importance of an attribute can be calculated by examining the range of values across all levels of the attribute.
  - Duration: Range = 20 (60-40)
  - Comfort : Range = 4 (52-48)
  - Cost : Range = 53 (76-23)
- These ranges tell us the relative importance of each attribute.

An Example

- What if we add some factors and levels to our test?
    - Will a price change of $50, $100, or $150 influence consumer's choice?
    - Will consumers pay more for a flight if they are provided with a hot meal rather than a snack?

An Example

Revised test design for Airline Ticket

Price	Connections
1) $400	1) Direct
2) $500	2) One Stop
3) $600	
4) $700	
	Meal
Seat size	1) No Meal
1) Regular	2) Snack
2) Wide	3) Hot meal

- When we add this small level of complexity to our example, the number of possible product scenarios skyrockets from **8** (2 x 2 x 2), to **48** (4 x 2 x 2 x 3)!
  - Way too much cost and administrative effort to collect this data – very likely, data would get mislabeled, etc.)

An Example

- Fortunately, we are able to use the science of **experimental design** to cut down on the number of scenarios.
  - In a typical conjoint study, respondents will only rate between 10-20 scenarios.

Another Example

Dependent Variable: Sales $ generated for advertised product

Factor	Factor	Levels
A	Size (of Ad)	1/8, 1/4 page
B	Color	B&W, Color
C	Location	Top, Bottom
D	Rest of page	Ads, Articles
E	Magazine	X, Y
F	Layout	Clut'd, white

- With this test design 64 (=2^6) combinations are possible.

Experimental Design

- An experimental design needs to achieve BALANCE.*

	A	B	C	D	E	F	Data
1	L	L	L	L	L	L	1375..
2	H	L	L	H	H	H	1392..
3	L	L	H	L	H	H	1235..
4	H	L	H	H	L	L	1465..
5	L	H	H	H	L	H	1293..
6	H	H	H	L	H	L	1401..
7	L	H	L	H	H	L	1314..
8	H	H	L	L	L	H	1420..

* Needs to achieve “orthogonality” – the different levels of the factors across the scenarios are uncorrelated, thus the average rating of one factor’s levels is unaffected by the average rating of other factor’s levels.

Analysis of Results

- Through performing an Analysis of Variance, (ANOVA) we can see which factors, explain the variance in our dependent variable.
- In this case, there are only 3 factors which explain the variance in $ sales at a significant level.

FACTOR	F-VALUE	P-VALUE	%EXPLAINED
A	38.03	.0001	40.5
D	6.79	.0168	6.3
E	9.59	.0013	9.4
ERROR			43.8

Analysis of Results

- Next, we calculate the average A to T for each level for each of the 3 factors that were explaining the variance in the DV at a significant level.
- We find the A to T obtained for the Core Concept – Management's best guess at the most realistic product configuration (or their favorite).

Factor level	Average ($)	Incremental difference
A-L (C) A-H	1260.38 1435.68	-60.77 114.53
D-L (C) D-H	1311.00 1385.06	-10.15 63.91
E-L (C) E-H	1392.06 1304.00	70.91 -17.15
Core Concept	1,321.15	

Analysis of Results

- For example, 1260.38 is the mean of the data values with A=AL and, is 60.77 under average core concept A to T of 1321.15

  BEST LEVELS: AH, DH, EL.
  (Size = 1/4, Rest of page=articles,
  Magazine = X)

Analysis of Results

The average at the best combination is (should be):

1321.15	+ 114.53	+ 0	+0	+63.91	+70.91	+0
Core	A	B	C	D	E	F

= $1570.51

Analysis of Results

Once an optimal combination is determined, a confirmation or verification test should be performed - to confirm the findings of the research.
(Test Market or STM)

Consider our optimal solution:
A, C, D, F high
B, E low
WE NEVER RAN THIS COMBINATION!

That's usually the case. Here, we have 64 combinations, and ran only 8. Thus, it was 7:1 odds that we did not run the (purported) optimal.

Additional Conjoint Options – Interaction Effects

- A **main effect** is the effect of a factor, averaged over all levels of all other factors – this is what we have been illustrating in this document so far
- However, that's not the whole story! There may be another "forces" at work (other than the ubiquitous "noise" or "error"):
- **Interaction effects** (In some social sciences, "synergy")
- If the effect of one factor is **different** for different levels of another factor, then the **two factors interact**.

Interaction Effects

	B_L	B_H
A_L	5	9
A_H	10	?

If $A_H B_H$ = 14, no interaction

If $A_H B_H$ > 14, + interaction

If $A_H B_H$ < 14, - interaction

Start at A_L, B_L:

When B goes from L $\rightarrow$ H, yield goes from 5 $\rightarrow$ 9 ; EFFECT = 4

When A goes from L $\rightarrow$ H, yield goes from 5 $\rightarrow$ 10 ; EFFECT = 5

When both changes take place, does yield go up by (4+5)=9, giving AHBH = 14?

Interaction Effects

- In order to measure interaction effects the experimental design is usually altered to more closely measure the effects between certain variables – usually increasing the number of scenarios tested.
- Thus, the decision to measure these effects must occur during the research design process.