On the Appropriate Use of Conjoint Analysis in Pharmaceutical Marketing Research : Some Examples and Suggested Solutions

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On the appropriate use of conjoint analysis

A. Some definitions

Conjoint analysis – the term

- Conjoint = considered jointly

Conjoint analysis – the research technique

- A family of paradigms for the algebraic representation of individual judgements of multi-attribute stimuli. …. concerned with the quantitative description of consumer preferences and trade-offs.

Trade-offs

- assumes consumers choose between competing products by comparing/evaluating the totality of their features.

Quantitative; consumer preferences

- assumes the value of a product is formed by combining the separate amounts of value of each product feature.

Multi-attribute stimuli

- assumes that hypothetical products can be
  - designed in a systematic way
  - meaningfully communicated to respondents.

Individual judgements

- assumes that hypothetical products can be evaluated by respondents
  - ranked in order of preference
  - rated for preference or likelihood of purchase
  - volume of purchase indicated
  - whether would be chosen instead of a current preference
  - etc., etc.

Algebraic representation

- assumes that respondent preferences and multi-attribute stimuli can fit to a mathematical equation
  - most frequently
  - OLS (ordinary least squares) – used with preference-based data
  - MNL (multinomial logit) – most often associated with choice-based data
  - equation is then used to simulate (new) market structures

Family of paradigms

- Popular 'off the shelf' paradigms fall in to one of 3 types
  - 'classic' full profile[1] paradigms
    - Conjoint Value Analysis (CVA – Sawtooth)
    - Conjoint Analyser (Bretton Clark)
    - SAS, SPSS
    - use ranking/rating question; OLS analysis
- Discrete choice (choice based) based paradigms
    - DCM (Discrete Choice Modeling)
    - CBC (Choice Based Conjoint - Sawtooth)
    - SAS – particularly useful for design stage
    - use choosing question; MNL analysis
- Partial profile paradigms
  - ACA (Adaptive Conjoint Analysis – Sawtooth)
    - hybrid design
      - self-explicated individual attribute ratings
      - adaptive algorithm to select partial profiles
    - Partial Profile CBC (Sawtooth)
      - random, balanced design of partial profiles

Very important to remember that the choice is not restricted to these

- more on this later.

Why use conjoint methods?

* Models the human decision making process

origins in psychometric theory

* Trade off data more sensitive than ratings of individual product attributes
* Shown to be superior to non-trade off models

non-trade off = rating of importance of individual attributes

appears to be universally accepted

- not debated here.

*

[1] The term "full profile" is a confusing term when used in conjoint analysis. It is often used to describe a type of paradigm as well as the nature of the stimulus cards. The latter is correct but the former would be more accurately referred to if "ranking/rating" was used (to distinguish from "choice" based paradigms) as both use full and partial profiles. Nevertheless the term is in popular use to describe paradigms that use OLS analysis and it is this meaning that is used here.

B. When Not to Use Conjoint Analysis

1. In Principle

- When it is clearly
- not appropriate at all
- not the best research approach

when the problem is being fitted to the technique

- hopefully this situation will be rare, if not non-existent
- When assumptions under-pinning conjoint methods are violated

In design & data collection stages

- basis for product choice cannot be captured in an attribute & level grid
- product features cannot be fully/correctly communicated
    - particularly when a sense other than sight (reading) has to be involved – e.g.
        - perfume, bottled water, drug patches

In simulations

- all products not equally available for all to use.
- Certainly do not use

    when the choice of product has little, or nothing, to do with trading off product attributes

    when attributes that determine choice cannot be communicated with the methods available for the data collection exercise

    when the real decision-affecting attributes are not known

- although hybrid & partial profile designs could be used as a list reduction exercise
    - other ways might be less expensive.

2. In General

- Be very wary of using (especially with standard paradigms) where one/two attributes, over which you have little/no control, may be dominant
- accuracy of marginal effects of other variables may be compromised
    - their real contribution may not be identifiable

where 'brand' is a dominant attribute and removing impossible profiles compromises the orthogonality and balance of the design

- e.g 'a Ca2 antagonist brand with an ACEI mechanism of action'
    - any results from the conjoint data analysis are likely to be incorrect, even though the design was analyzable

for research for new product price-setting

- as opposed to establishing the role of price in the product choice decision – where conjoint analysis can be ideal
- conjoint methods have been shown to exaggerate the role of price
- which is why they are popular with many consumer researchers

when single entity new product entrants are being simulated in a multiple therapy market

- e.g. a new short acting bronchodilator entering the COPD market
  - the offers under test are alternative new bronchodilators which can replace other bronchodilators in a multi-drug regimen, be added to an existing drug regimen or added to non-drug therapy
- utility scores and trade offs may be reliable
- priorities for R&D may be identified
- but market simulations are likely to be very misleading
  - therefore prioritisation will not include commercial competitive appeal unless special steps are taken in the conjoint design
- the conjoint question setting will require careful consideration
- a bespoke simulation module will probably be required
  - in order to:

reflect reality in terms of

where market gains come from

identifying market expansion

more patients on drug therapy

more drug items per patient.

3. Particular Paradigms

* When assumptions under-pinning paradigm do not fit the market and the drift away from reality can cause error

use of general setting for the conjoint question when it is known that the reality is that 'it depends on the patient'

- option 'A' might be generally preferable to option 'B' but both would be used by the respondent according to the patient situation
  - this can lead to major over- and under-estimations of the use of alternatives when conducting market simulations
    - and to grossly misleading results

use of a main effects only, additive analysis model when interactions are likely to be present

- level of one attribute effects sensitivity to other attributes
  - e.g. when brand and price are both included
    - reaction to price changes could well be different for market leader versus older declining brand
- use of a choice-based paradigm (that cannot analyze at the individual respondent level and assumes homogeneity) when the universe is known to be heterogeneous
  - the 'average' customer can be very misleading
    - especially if extreme views exist in a skewed distribution

- use of constant, uniform profiles of current products in market simulations when considerable variation is known to exist
  - one source of over-estimation of new product uptake
    - we know that

images of current products vary, often asymmetrically

  - established products often carry a higher utility score than is made up from the sum of the parts

and 'perception is reality'.

- When the sample size & experimental design possible (affordable) is not likely to lead to a 'good fit' result

applies particularly to choice-based designs in situations where the number of choices per choice set also has to be small. For example,

- PC-based interviews
- older patients where eyesight may be an issue.

- Solution to these issues lies in considering all stages of the conjoint paradigm at the initial planning stage

  stimulus material
  conjoint question setting
  analysis method
  simulation module

- and to avoid options that take you away from the realities of the market.

C. When to Use Conjoint Analysis with Caution

- when it may not be the most appropriate or, may not be best approach

1. When essentially similar products have very different market shares

- This means that profiles of current products cannot be put into conjoint simulators

the output would be equal shares for products with similar profiles

A common problem in crowded markets

- e.g. oral antibiotics, antihypertensives
  - brands cannot be distinguished on the attribute & level grid but have very different market shares
    - due to 'number in launch sequence' & 'time to launch' effects as well as marketing spend/quality

- To accommodate this the conjoint paradigm used has to carry 'brand' image and choice "as is" throughout; from design & data collection through to simulation

this is not a common feature of "off the shelf" paradigms

2. When 'brand' has a dominant role

- The "obvious" solution of including 'brand' as an attribute can lead to its own particular problems

How to measure 'brand' effect?

- unrealistic and/or impossible product concepts in stimulus card set
  - certain levels on other (non-brand) attributes could be credible but others not at all – e.g.
    - brand + new indication = credibility due to new clinical data
    - brand + reduced side effects = credibility due to new formulation

brand + a particular side effect = not credible due to mechanism of action of class

  - brand + new mechanism = not credible

How to create 'brand' effect for new products in simulations?

- can image of new brand be communicated?
- should new brand image be bench-marked to an established product?
- should another 'external effects' parameter be estimated?

- The solution lies in the design of the paradigm throughout all modules and doing this in advance

consider hierarchical designs

- e.g. products within a class & classes within a market

3. For pricing (importance) research

* The debate here is often as to which of choice-based paradigms or 'classical' full profile ranking/rating paradigms performs universally best

This debate applies equally to attributes other than price

Choice-based paradigms often quoted as being superior to ranking/rating-based paradigms

- usually based on ACA and CBC comparisons
  - which need not necessarily be due to the paradigms themselves but due to
    - fewer number of attributes in CBC studies
    - with 'price' often having more levels (the NOL effect)

Advantage of a choice-based paradigm

- logit (MNL) analysis allows for interaction terms (e.g. price/brand)
  - price elasticity curves can be different for each brand
    - often a more realistic reflection of the market place
    - difficult to include within regression-based (OLS) paradigms

can invalidate the model if price elasticity for older/high-share products and newer/low-share products are significantly different

Advantage of a ranking/rating-based paradigm

- regression (OLS) analysis allows for analysis at the individual respondent level
  - price elasticity curves can be different for each individual
    - often a more realistic reflection of the market place
    - difficult to include within most logit-based (MNL) paradigms

MNL working with the "average" respondent can lead to incorrect results – unknowingly

unless sample size allows pre-analysis segmentation or Hierarchical Bayes analysis is possible

Remember that while individual choices are included in the data collection stage of choice-based paradigms, they very rarely carry this information through to the simulation stage

- a major redundancy of potentially valuable information

  * Perhaps the debate should be focused on how to capture the best features of both types of paradigm

as is occurring among US-based conjoint academics and software developers

4. For price setting research

* The price-volume relationship is a function of the value placed on the product offer

Therefore a three-dimensional situation

Probably best perceived as a family of price-volume curves with each curve representing a different value proposition

- can the value proposition be expressed in a conjoint setting?
  - does it need to be?
    - is conjoint an appropriate approach?

Is conjoint an appropriate approach?

- at the time of price setting the product offer should be known
  - performance = direct and indirect benefits
  - positioning strategy
  - hard & soft image desired

In price setting research the only trade off should be product and price – branding and positioning should have been decided by now

- the conjoint solution therefore is to
  - add other attributes to the design
    - making the objectives fit the research!

or, including trade offs that preclude a proper value assessment of the product offer

- use Brand Price Trade Off (BPTO) – a 2-attribute conjoint paradigm
  - traditionally a 'pencil & paper' design

all price movements in upward direction probably exaggerates importance of price shown to indicate greater price elasticity than non-conjoint methods actually known to exist

* Use PC-based BPTO, if convinced conjoint method is the way to go

but consider non-conjoint methodologies and make an informed decision

5. When all existing products are not equally interchangeable with a new product entry

* The IIA (Independence from Irrelevant Alternatives) problem

called the 'red bus/blue bus' problem

- adding a new bus company in blue livery will take share proportionately from the original red livery company and from car, train, cycle or whatever alternatives where in the data collection design and simulation exercise

* Be wary of using simulator modules that assume that new products will take share indiscriminately and proportionately from all other products in the market

simulators that use conjoint data at the aggregate level (as is the case with most choice/MNL-based paradigms) suffer here

- for example
  - in the anti-hypertensive market the implicit assumption made is that a new AII antagonist will take share from products in all other classes
    - indiscriminately and in proportion to market share
    - yet is probably most likely to take from share from existing AIIs, then from ACEIs, …… and least from diuretics.
- in life cycle management

new formulations and other line extensions will take share much more with the original compound than from other competitors

6. When the market is about to be exposed to significant change

* This is a particular, but very relevant, example of the implicit assumption that the future will be like today being violated. Examples encountered include:

several new products about to be introduced

- the "number to launch" effect becomes more pronounced

environmental changes shifting relative importance of an attribute

- price is only one example

* The solution lies in applying other knowledge gathered outside of the conjoint experiment and then

adding an additional attribute - an 'external factor' weighting the sample

- requires a paradigm that permits analysis at the individual level

weighting utility scores within the calculated set

- common in consumer research to correct for counter-intuitive simulation results

7. When alternative possible actions cannot be profiled on the attribute & level grid

* The issue here is having product alternatives that compete with the product group under consideration but have unique non-overlapping features

surgery cannot be profiled using the same attribute set as drugs

The apparent solution is to extend the attribute & level grid leading to irrelevant attributes (features) for some products, but

- attribute list becomes large
- irrelevant attributes lead to profiles that
  - annoy respondents
  - are technically impossible & unacceptable
- levels within attributes irrelevant for some alternatives can lead to
- technically impossible and unacceptable profiles
  - exaggerated measures of attribute importance
  - incorrect measures of attribute importance within a product group

* The solution lies in the design of the paradigm throughout all modules and doing this in advance

use a paradigm that accommodates individual choice (not a 'no-buy' option) in the conjoint question and carries this through into the simulator module

8. When the task for respondents is too daunting/unwieldy

* The issues here are the number of attributes in the design and/or the number of cards in the task

Too many attributes (Can they all be important!?)

- the stimulus cards include too much information
  - can it all be taken in, the information assimilated
    - & meaningful comparisons be made?
  - in the desire to have small designs, this can lead to erroneous (illogical) results wrt attribute importance
    - or just too many cards

Too many levels (within attributes)

- can lead to large designs in order to achieve orthogonality
- can lead to incorrect conclusions on attribute relative importance
  - remember, importance measures relate to the attribute range & <u>not</u> to the attribute per se
  - there is also the NOL (number of levels) debate to consider

Too many cards

- the rating/ranking task in full-profile/OLS paradigms very onerous
  - an orthogonal design + hold out cards = 30+ cards
    - too many ties if rated
    - too long to rank reliably
- the number of choice tasks in choice/MNL paradigms very long
  - efficiency of design depends on
    - # of cards per task
    - and # of tasks per interview
    - concern is respondent fatigue

The use of partial profiles or bridging designs can overcome these problems

- but at a cost
- Bridging designs in effect add respondents to make 'super respondents'
  - can the sample be designed to accurately match respondents
  - obvious implications for sample size
- Partial profiles are used in the most widely used hybrid paradigm (ACA)
  - but self-explicated ratings of individual attributes are used
- A version of CBC with partial profiles is now available

- but larger samples will be needed

  * An alternative to one-off larger samples and relying on a hybrid main effects paradigm (ACA) may be to

- use ACA to reduce attribute list
- and to provide an initial understanding
  - followed by a choice-based paradigm with individual level analysis and simulation
- to provide the final model

D. Some concluding thoughts

  * Having concluded that a conjoint (trade off) method is appropriate

- Consider the choice of paradigm very carefully
- do not be influenced by claims for universal, or even general, superiority of one paradigm over all others
- consider the market place you are working in and the assumptions within the paradigm

  * Very important to remember that the choice is not restricted to the (short) list of standard 'off the shelf paradigms' and that customized solutions are possible and often desirable, particularly at the analysis and simulation stages – e.g.

- 'Exploded' choice sets from rank order data
- combines benefit of ranking-based data collection
  - more data per respondent; smaller samples
- and benefit of choice-based analysis methods
  - interactions can be modeled
- simulation can be at individual level
  - Hierarchical Bayes analysis
- computes individual respondent utilities from choice sets
  - over comes a major problem/limitation with (discrete) choice paradigms
- available now as an extension of a discrete choice paradigm – CBC/HB (Sawtooth)
  - CAPMOD (Choice Adapted Predictive Modelling – Adelphi)
- flexible simulation module
- adds reality to simulations
- designed to produce more reliable future market simulations
  - especially those that include new product predictions
- can be applied to most conjoint outputs
  - requires extra question in conjoint questionnaire
    - choice threshold question with ranking designs
    - likely level of use question with choice question designs
- of real benefit with the smaller samples often unavoidable in pharmaceutical research

  * Above all remember that

- it is not so much a "use/not use" issue as one of
- "use correctly/abuse" conjoint analysis

  - the choices that can be made and the decisions that must be made for all stages of your conjoint paradigm …..
- design of stimulus material
- conjoint question to be asked
- setting for conjoint question
- conjoint data analysis method
- outputs required
- simulation module

- model validity checks should all be made at the start and, be based on research objectives and market realities
  - do NOT be dictated to by the (so-called) limitations of the conjoint paradigm being recommended
- there are many options
  - if required, bespoke designs are not necessarily difficult
  - remember that the availability of choices in conjoint design and the decisions for you to make in the design
- represent an opportunity for
  - more realistic and reliable future market simulations
  - research that really adds to decision making