The Use of Choice-Based Conjoint Analysis and Willingness to Pay in Patent Damages

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Overview

• What is choice-based conjoint (“CBC”) analysis and what patent damage issues does it seek to answer?
• What is willingness to pay (“WTP”)?
• CBC, WTP and the calculation of IP damages (within the context of Georgia Pacific)
• Admissibility/Daubert considerations
• Application of CBC and WTP in Apple v. Samsung
• What’s ahead?
How Did We Get Here?

• Entire market value rule applicable only when the patented feature is basis for consumer demand - *Lucent v. Gateway*.

• *Cornell v. HP, IP Innovation v. Red Hat* – Judge Rader criticizes failure to link consumer demand to the claimed invention. (GP #8, #11, #13)

• Infirmities with apportionment and attribution methods (royalty rate v. royalty base).

• Contemporaneous business documents are rarely a useful guide in isolating the value of individual features as they pertain to use of the technology at issue

• Task: How to value features/technology when no independent market exists (no sales with and without the patented feature)
Conjoint Analysis

• A credit card could offer a multitude of features that consumers value – acceptance, rebates, insurance, related services, etc.

• Consumers want the most features at the lowest price. From the perspective of the producer, however, this may not be true given production costs.

• There are no neutral ‘control features’, so demand must be measured relative to other attributes consumers likely prefer.

• Therefore, there are trade-offs between price and features that producers don’t know before product launch. Conjoint analysis permits a realistic evaluation of choices among hypothetical features that vary simultaneously: conjoint = “consider jointly”.

• The predominant form of this is so-called “Choice-Based Conjoint” analysis (“CBC”), where products are considered to be different combinations of features and price.
Conjoint analysis has long been used in product design and pricing:

- Heublein distilled spirits
- AT&T in cell phone features
- IBM RISC 6000 Workstation features
- UPS study of features among overnight letter carriers
- MasterCard travel and entertainment features
- FedEx design of tracking system
- Marriott time-share units
- Ritz Carlton rooms
- Packaging of Monsanto herbicides
- AARP health maintenance plans
- EZ Pass
Use of Conjoint in Non-Patent Cases

- U-Haul v. Jartan *Lanham Act*
- Continental Airlines v. American Airlines *Contract*
- Barbara Schwab et al v. Philip Morris *RICO/False Claims*
- U.S. v. Dentsply *Antitrust*
- Aspen Highlands Skiing v. Aspen Skiing Co. *Antitrust*
### Illustrative Features of a Golf Ball

<table>
<thead>
<tr>
<th>Average Driving Distance</th>
<th>Average Ball Life</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>225 yards</td>
<td>50 holes</td>
<td>$1.75</td>
</tr>
<tr>
<td>250 yards</td>
<td>30 holes</td>
<td>$2.00</td>
</tr>
<tr>
<td>275 yards</td>
<td>20 holes</td>
<td>$2.25</td>
</tr>
</tbody>
</table>

**Consumer's Ideal Ball**

- 275 yards
- 50 holes
- $1.75

**Producer's Ideal Ball**

- 225 yards
- 20 holes
- $2.25
Consumers and Producers

• From a consumer’s point of view, the ideal ball would be the one with the longest average driving distance, the longest average ball life, and the lowest price.

• From a producer’s view, an ideal ball would be the highest price, perhaps with the shortest average distance and life (assuming it costs less to produce such a ball).

• Therefore, from a marketing perspective, the most viable option is a product lies somewhere in between. But the producer does not know where.

• This is the role of CBC. In this example, it would examine consumer preferences and trade offs between life, distance, and price jointly.
Elements of CBC Analysis

• Pre-testing and survey design (how many attributes to be tested – six considered to be the outer bound).

• Survey execution (can be conducted online).

• Processing and analysis of survey results.

• Use of results to determine “partworths”.

• Testing for economic logic of partworths (what, if anything, went wrong in the “black box”).

• Input to royalty rate measure.
CBC Surveys

- CBC is implemented using a survey where participants are a random sample of a target population (experience with the product).

- Respondents are presented with a series of questions that examine price/attribute trade-offs.

- In the golf ball example, each respondent would be asked to rank driving distance against ball life and ball life against price. Some respondents may have strong preferences for distances, and others for life.

- Typically, survey size is about 500 respondents. More recent surveys used in litigation have used sophisticated statistical techniques to analyze the dispersion of responses.
## Two Hypothetical Respondents

### Respondent 1
(Weak Preference for Distance)

<table>
<thead>
<tr>
<th>Distance</th>
<th>50 holes</th>
<th>30 holes</th>
<th>20 holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>225 yards</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>250 yards</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>275 yards</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

### Respondent 2
(Weak Preference for Life)

<table>
<thead>
<tr>
<th>Distance</th>
<th>50 holes</th>
<th>30 holes</th>
<th>20 holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>225 yards</td>
<td>4</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>250 yards</td>
<td>2</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>275 yards</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>
Values are assigned to the attributes, which is somewhat arbitrary. Key: better attributes should be given higher values.

**Respondent 1**

(Weak Preference for Distance)

<table>
<thead>
<tr>
<th>Distance</th>
<th>50 holes</th>
<th>30 holes</th>
<th>20 holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>225 yards</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(50)</td>
<td>(25)</td>
<td>(0)</td>
</tr>
<tr>
<td>250 yards</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(110)</td>
<td>(85)</td>
<td>(60)</td>
</tr>
<tr>
<td>275 yards</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>(150)</td>
<td>(125)</td>
<td>(100)</td>
</tr>
</tbody>
</table>
## Trade Off Between Life and Price

### Respondent 1 Ranks

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$1.75</td>
<td>$2.00</td>
<td>$2.25</td>
</tr>
<tr>
<td>50 holes</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Life</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>20 holes</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

### Respondent 1 Values

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$1.75</td>
<td>$2.00</td>
<td>$2.25</td>
</tr>
<tr>
<td>225 yards</td>
<td>70</td>
<td>55</td>
<td>50</td>
</tr>
<tr>
<td>Distance</td>
<td>45</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>250 yards</td>
<td>20</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>275 yards</td>
<td>20</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>
Given the Conjoint Trade Offs

• We obtain a complete set of values, which are called “utilities” or “partworths” or “partworth utility”. Utility is simply economics for implicit value: individuals choose an outcome among option that brings them the highest utility.

• Below are the partworths associated with attributes.

<table>
<thead>
<tr>
<th>Average Driving Distance</th>
<th>Average Ball Life</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>225 yards</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>250 yards</td>
<td>60</td>
<td>30 holes</td>
</tr>
<tr>
<td>275 yards</td>
<td>100</td>
<td>20 holes</td>
</tr>
</tbody>
</table>
The results allow us to compare the total utility a respondent would achieve given two hypothetical configurations.

<table>
<thead>
<tr>
<th></th>
<th>Long-Distance Ball</th>
<th>Long-Life Ball</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distance</strong></td>
<td>275 yards</td>
<td>250 yards</td>
</tr>
<tr>
<td><strong>Life</strong></td>
<td>20 holes</td>
<td>50 holes</td>
</tr>
<tr>
<td><strong>Price</strong></td>
<td>$2.00</td>
<td>$2.25</td>
</tr>
</tbody>
</table>
Choose the golf ball that yields highest utility: **long life**.

<table>
<thead>
<tr>
<th></th>
<th>Long-Distance Ball</th>
<th>Long-Life Ball</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attribute</strong></td>
<td><strong>Partworth</strong></td>
<td><strong>Attribute</strong></td>
</tr>
<tr>
<td>Distance</td>
<td>275 yards</td>
<td>250 yards</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>105</td>
</tr>
<tr>
<td>Life</td>
<td>20 holes</td>
<td>50 holes</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Price</td>
<td>$2.00</td>
<td>$2.25</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>
Feature Willingness-to-Pay (WTP)

WTP for features can be estimated using the partworth utilities, from which a royalty rate can be derived.

**Step 1:**

Hypothetical Price Change: $2.25 - $2.00 = $0.25

Change in Utility: 20 - 5 = 15

Implied “dollars per util”: $0.25 / 15 = $0.017

**Step 2:**

Utility Gain from Feature: * 50 utils minus 25 utils = 25 utils

Willingness-to-Pay: 25 utils x $0.017 = $0.42

Royalty rate: $0.42 / $2.00 = 21%

* Extending the average golf ball life from 30 holes to 50 holes
Royalty Base Simulation

The partworth utilities can be used to estimate product demand under alternative feature/price combinations.

<table>
<thead>
<tr>
<th>Feature/Price Combination</th>
<th>Utility</th>
<th>Share (linear)</th>
<th>Share (logit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-Distance Ball at $2</td>
<td>105</td>
<td>49%</td>
<td>1%</td>
</tr>
<tr>
<td>Long-Life Ball at $2.25</td>
<td>110</td>
<td>51%</td>
<td>99%</td>
</tr>
</tbody>
</table>

The predicted shares can be applied to a target customer universe to estimate the royalty bases under alternative feature/price scenarios.
Because CBC is survey based, the methodology must meet standards of survey evidence.

Admissibility standards for survey evidence:
- Pre-test
- Sample design/frame
- Interview standards (phone/online)
- Response rate/response bias
- Statistical significance

A departure from business applications of conjoint.

Some conjoint programs don’t produce adequate validation measures.

Testifying expert needs to be well versed in survey methods (even if survey is executed by a third party vendor).
Advantages of CBC

• Directly examines trade offs that consumers make when evaluating multiple attributes.

• Measures individual consumer preferences, which can be aggregated statistically over a sample of respondents (can easily equate to thousands of purchases).

• If the survey is properly designed, the ability to model interactions between attributes can be used to develop a consumer’s “willingness to pay” (WTP).

• This translates to a more accurate/reasonable measure of value for the patented feature.
But Many Important Issues to Consider

• No shortcuts. Quality survey may still require meaningful inference.

• With too many options, respondents may resort to simplification strategies.

• Time dimensions (features may have built actual demand which is not the same as prospective demand at the hypothetical negotiation)

• Respondents may not be able to articulate attitudes or may feel forced to think about issues they would otherwise not give much thought to.
• Insufficient context to value individual features means everything becomes over-valued: sum of feature values well in excess of the cost of the good.

• Poorly designed studies may place too much value on emotional/preference variables and undervalue concrete variables.

• Development of a proper survey requires detailed pretesting to ensure attributes are understood.
CBC and Damages

- It is generally agreed that CBC provides reliable and valid estimates of partworth utilities.

- With a valid sample of actual or likely purchasers, CBC is an ideal method to summarize the price premium that consumers in the market are willing to pay for various features.

- The backend statistical methods, while complicated, capture the dispersion of partworths over the sample of respondents. Some will have higher partworths and some lower.

- If those features are covered by a patent, CBC partworths capture directly the market’s valuation of a patent.

- The results can be summarized easily for a judge and/or jury.
Willingness to Pay (WTP)

• In economics, the willingness to pay is the largest amount an individual would be willing to pay (or exchange) in order to receive a good or to avoid something undesirable, such as pollution.

• A transaction occurs when an individual’s WTP exceeds an offered (or market) price.

• In the context of an intangible like pollution, measuring the market price for cleaner air is not possible as there are (currently) no markets on which clean air is exchanged.

• The same principle holds for valuing a patent. Individual attributes rarely trade: one buys an iPhone at a particular price, an attribute of which is its shape.
Translating CBC/WTP to a Reasonable Royalty

• In many cases the patent will enable the feature rather than be the feature (attribution issues)

• Non-infringing alternatives must also be considered (generating the same or similar demand)

• A measure of post-purchase demand can bias results in either direction
Apple v. Samsung

- Apple sued Samsung in April 2011, noting that Samsung “…made a deliberate decision to copy Apple’s iPhone and iPad…” At issue, patents for smartphones and tablets, covering the “look and feel” of the devices as well as how the gadgets work.

- 677 and 087, which cover iPhone designs; 889, which covers the design of the iPad; and 305, which covers the iPhone graphical user interface.

- The utility patents all have to do with the multi-touch user interface. They include 381, which covers the ‘bounce-back’ functionality that users see when they move past the end of a photo or list; 163, which covers the tap-to-zoom feature; and 915, which covers scrolling versus gesture motions.

- Samsung countersued in June alleging several of its patents had been infringed.
After three days of deliberations, a California jury reached a unanimous verdict. Finding largely for Apple, the jury decided that Samsung had willfully infringed both Apple patents and trade dress for the iPhone. The jury also found that Samsung owes Apple over $1 billion in damages—potentially trebled—for willfully infringing on Apple's intellectual property.
Apple’s expert, MIT Professor John Hauser, conducted two separate surveys of Samsung consumers using CBC techniques.

- Preferences tested – touchscreen capabilities, size/weight, camera, storage, connectivity, number of apps, price
- Memory was varied within each attribute – 8GB, 16GB, 32GB, 64GB

He concluded that “for both smartphones and tablets, Samsung consumers are willing to pay a significant price premium for the tested features that are covered by the patents at issue.”
• Using the CBC techniques, he calculated that, at a price point of $199 for smartphones, Samsung consumers’ WTP for the 915 patent alone was $39. For all smartphone patents in dispute, WTP was $100.
Daubert Proofing

• Best practices: CBC well accepted and vetted in the marketing literature. Its non-litigation and non-patent litigation applications validate its reliability.

• Expected pitfalls: must meet standards of admissible survey evidence, statistical reliability, and economic logic.

• Subjective judgments (no. and choice among alternative features) should go to weight, not admissibility.

• Results must be applied consistently – demand establishes the royalty rate and potentially the royalty base.
Use of CBC/WTP in Patent Litigation

- TiVo v. EchoStar *(multimedia time warping system)*
- Kearns v. Ford *(intermittent wipers)*
- Oracle v. Google *(relative value of copyrighted v. patented features; estimate overall mkt. share w/o features at issue)*
- Fractus S.A. v. Samsung *(cell phone antennas)*
Concluding Issues

• ‘Black Box’ Issues

• Identifying the consumer
  - Purchaser as the user (Smartphone)
  - User distinct from purchaser (IT goods)

• Utility is ex-post
  - What’s happened since the hypothetical negotiation?