Conjoint Analysis

Fall 2018

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What is Conjoint Analysis?

CON - JOINT

conjoint /kənˈdʒɔɪnt/ •)

adjective adjective: conjoint

combining all or both people or things involved. "the conjoint involvement of the two cerebral hemispheres"

Origin			
OLD FRENCH conjoindre ENGLISH	njoint e English		"Join together"
Middle English: from Old	French, past participle of	of conjoindre (see conjoin)	
Translate conjoint to	Choose language	Y	

What is Conjoint Analysis?

- Products are represented as bundles of <u>attributes</u>.
- Levels of each attribute define the product.



What is Conjoint Analysis?







 Conjoint analysis is a survey-based technique that allows the analyst to understand people's preferences for a [product / service / brand / medical treatment / job / course] and especially the trade-offs they make in making choices.

Trade-Off between Product Attributes



9 US dollars



114K US dollars

Why Conjoint Analysis?

- In <u>direct surveys</u>, respondents might say they consider all attributes important
 - Not informative
- Conjoint enforces <u>tradeoffs</u> between attributes
 - All attributes evaluated at once
 - Respondents evaluate "complete" products with both strong and weak attributes
- Conjoint reduces problem of <u>socially desirable answers</u>
- Conjoint adds <u>realism</u>
 - In real-life consumers evaluate products, not isolated attributes (do they consciously know which attributes matter?)
- Conjoint analysis is <u>straightforward</u>
 - Suitable software is available (Sawtooth)

Why is that Relevant?

• Every year, many new products are introduced...





Consumer Survey of Product Innovation

Why is that Relevant?

• But very few succeed...





Consumer Survey of Product Innovation

Course Objectives

• That is a major issue for companies...



Course Objectives

• At the end of this course, you will be able to help companies design products that work:



- How to position existing products better?
- How to price existing and new products?

How to manage product portfolios / product line designs?

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An Example

Naar welk product gaat je keuze uit?



© Valerie Vos, MSc Thesis 2015

Why Do We Need a Course for This?

• Product design decisions are highly complex...

De nieuwe MacBook Air.

Power in overvloed. De hele dag.

11-inch vanaf € 1.029 | 13-inch nu vanaf € 1.129



Why Do We Need a Course for This?

• A product is characterized by many, many, many attributes...





11-inch MacBook Air

11.6-inch LED-backlit

Up to 1.7GHz dual-core

Intel Core i7 processor

0.11 to 0.68 inch thin;

Core i5 or 1.7GHz dual-

From \$999

glossy display

2.38 pounds

Specifications 1.3GHz dual-core Intel

core Intel Core i7

4GB or 8GB memory

Up to 512GB flash

Intel HD Graphics 5000

Integrated 38-watt-hour

lithium-polymer battery

45W MagSafe 2 power

adapter with cable

management system

MagSafe 2 power port

Up to 9 hours wireless

11.6-inch LED-backlit

Other Features

glossy widescreen display

processor

storage

Battery



From \$1099

glossy display

2.96 pounds

Intel Core i7 processor

0.11 to 0.68 inch thin;

1.3GHz dual-core Intel

core Intel Core i7

4GB or 8GB memory

adapter with cable

management system

18.8-inch LED-backlit

Two USB 3 ports

Up to 512GB flash

processor

storage

web







Page 16

Th	un	d

web

Display

- Two USB 3 ports
 - erbolt port
- Thunderbolt port

HDMI port

HDMI port

Why Do We Need a Course for This?

• And some of these attributes are very complex to understand

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Employee States	APPLICATION FOR GRO	-IFE INSURANCE
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Policy / plan no.	Division	TEIN
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Examples of Application

More than just product design...

Customer Complains on Social Media



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CUSTOMER SERVICE

How Customer Service Can Turn Angry Customers into Loyal Ones

by Wayne Huang, John Mitchell, Carmel Dibner, Andrea Ruttenberg, and Audrey Tripp

JANUARY 16, 2018



https://hbr.org/2018/01/how-customer-service-can-turn-angry-customers-into-loyal-ones





Identifying Relevant Attributes

How to respond to customer complaints?

Should we react at all?

Customers who received any kind of response to their tweet were willing to pay

- \$9 more for a ticket on that airline in the future.
- \$8 more, on average, for a monthly wireless plan from that carrier



Identifying Relevant Attributes

How to respond to customer complaints?

Should we be personal or not?

Being personal also helps: when a customer service agent added their name or initials in their first reply to a customer, we observed that their willingness to pay increased by

- \$14 for a future flight on that airline
- \$3 more for a monthly plan



Identifying Relevant Attributes

How to respond to customer complaints?

Should we be fast?

Responding Quickly to Customer Complaints Makes People Willing to Pay More in the Future

A study of tweets to airlines shows that when a tweet is answered in five minutes or less, the customer will pay almost \$20 more for a ticket on that airline in the future.



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Health Care

• This is not only relevant for marketing... Actually, the problem (and conjoint) is also applied many other fields, including medicine



Cancer treatment:

- Likelihood of success
- ✓ Risks
- ✓ Pain factors
- \checkmark Side effects
- ✓ Life disruption



Economics

- Evaluate transportation alternatives
- Compare energy alternatives
- Measure environmental impact



Law

- Measure effects of litigation
- Damage assessment
- Identify boundaries between firms
- Evaluate punishment alternatives
- Select jury members



Human Resources

- Screen potential employees
- Design compensation packages
- Select health care plans
- Evaluate performance
- Predict employee responses

Conjoint Experts

- Software developers
 - Sawtooth
 - Latent Gold
 - SPSS
 - SAS
- <u>Analysts</u>
 - Skim group <u>http://www.skimgroup.com/choic</u> <u>e-based-conjoint</u>
 - Ipsos
 - ► GfK
 - ...

- Companies using conjoint
 - P&G
 - Unilever
 - 3M
 - Microsoft
 - Caterpillar
 - **IBM**
 - Philips
 - Binck
 - • •
- Master theses





Course Structure

Course Overview



Part 1. Conjoint Design

- Ranking-based conjoint:
 - Choose the most-preferred product, then the second most-preferred product, ... until the least-preferred product

- Rating-based conjoint:
 - Give a score to each product in turn

- Choice-based conjoint:
 - Choice between different variants

Ranking-Based Conjoint



Rating-Based Conjoint

	Ice Crean	n Flavor		\	/anilla		
	Mix	In		Brown	nie Chu	nks	
	Торр	oing		С	aramel		
	Cor	ne		Waf	fle Cor	le	
	Scoo	pps		35	Scoops		
	Very Dissatisfied	Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Satisfied	Very Satisfied
Preference	0	0	Θ	0	0	0	0
							\sim

Indicate your preference for this Ice Cream offering

Rating-Based Conjoint

Stimulus/C	amera	Resolution	Optical Zoom	Screen Size	Rating
Camera	I	10 megapixels	3×	3 inches	
Camera	2	6 megapixels	5×	2 inches	
Camera	3	10 megapixels	5×	3 inches	
Camera	4	6 megapixels	3×	2 inches	
Camera	5	6 megapixels	5×	3 inches	
Camera	6	10 megapixels	3×	2 inches	
Camera	7	6 megapixels	3×	3 inches	
Camera	8	10 megapixels	5×	2 inches	

Rating-Based Conjoint

Stimulus/C	Camera	Resolution	Optical Zoom	Screen Size	Rating
Camera	I	10 megapixels	3×	3 inches	7
Camera	2	6 megapixels	5×	2 inches	7
Camera	3	10 megapixels	5×	3 inches	9
Camera	4	6 megapixels	3×	2 inches	5
Camera	5	6 megapixels	5×	3 inches	6
Camera	6	10 megapixels	3×	2 inches	5
Camera	7	6 megapixels	3×	3 inches	6
Camera	8	10 megapixels	5×	2 inches	7

Problems of Rating-Based Conjoint

- Not realistic
 - In real-life, we buy products rather than rating them
- Not clear whether spread in ratings is due to real preferences or due to response style
 - E.g., small spread in example above, weak preferences or cautious answers?
- Implications for sales levels and market shares are not clear
 - Sales and shares result from consumer choices, not ratings
 - What would be the rating threshold?

Why don't we ask the respondents to choose a product directly, rather than asking them to rate products?

Choose the most-preferred product only

	Fron	n the choices preser	nted here, please sel	ect your <u>most</u> prefe	rred choice.
		Qu	uestion 1 of 12 for th	is section	
Features		Choice A	Choice B	Choice C	Choice D
		C	С	C	0
	<u>Wine</u> Type	Aromatic White	Aromatic White	Aromatic White	Aromatic White
Q	Region	Sonoma/Napa California USA	S. America(Chile, Argentina)	Australia/NZ	Australia/NZ
	<u>Closure</u> <u>Type</u>	Traditional Cork	Traditional Cork	Metacork	Traditional Cork
\$	Price Range	\$AU15.00-\$19.99	\$AU15.00-\$19.99	\$AU15.00-\$19.99	\$AU15.00-\$19.99
	<u>Type</u> <u>of</u> Winery	Small Boutique	Small Boutique	Small Boutique	Mid-Sized regionally known

Toubia, Hauser and Garcia (2007)

Choice set I:



Camera A

<u>Camera B</u>

- Choice set I:
- Choice set 2:



- Choice set I:
- Choice set 2:
- •
- Choice set n = 8:



- We record the choices made by every customer during the *n* tasks (i.e. choice sets).
- Because, in every choice set, a different combination of attribute levels is used, we can derive the effect of different combinations of attribute levels on choice.

➔ preferences = attribute part-worths

As we repeat the conjoint exercise across many customers, we can also detect whether different customers have different preferences.

➔ Customer-specific preferences

Advantages of Choice-Based Conjoint

- Tradeoffs are enforced even more
- <u>*Realistic*</u>: the choice-setting mimics real-life
- ► Accommodates <u>no-choice option</u> ("none of the offered alternatives is attractive", "I would stick to my current product") → sales proxy
- Avoids the need of ad-hoc rules to predict *market shares*
- No <u>subjective scaling</u>
- Choice is cognitively <u>less demanding</u> than ratings (Louviere 1994)

Part 2. Conjoint Analysis

- Logistic Regression
- DV = product chosen or not
- IV = product attributes

DV = logit(IV)

e.g. choice = f(price, quality, color, speed, discount,...)

But What if We Have Different Tastes..

What if you prefer the freedom of an Android while I like the synchronization feature of the iPhone?



Latent-class and Hierachical Bayes are the answers

Part 2. Conjoint Analysis

- Aggregate level (same part-worths for all respondents)
 - Assuming same preferences may give misleading results
 - + High precision, as all respondents are combined
 - Method of analysis: LOGIT
- Segment level (different part-worths for different segments)
 - + Realistic, as segments take into account different preferences
 - + High precision if all respondents are used in one big analysis
 - Method of analysis: LATENT CLASS ANALYSIS (LCA)
- Individual level (different part-worths for each respondent)
 - + Realistic, as respondent have different preferences
 - + High precision thanks to the joint estimation
 - How many strategies should the firm implement given the diversity of preferences?
 - Method of analysis: HIERARCHICAL BAYES (HB)

Part 3. Market Simulations

Competitive market scenarios to predict which products respondents would choose



What Can the Choice Simulator Do?

 Lets you predict which SKU respondents or segments of the population will choose (estimate demand and market share)

 Lets you play "what-if" games to investigate the value of modifications to an existing product or alternative

• Lets you investigate product line extensions



بلوند

Price

Ferer

Quertity

Demano

Curve