

## **Conjoint analysis: case study for teaching**

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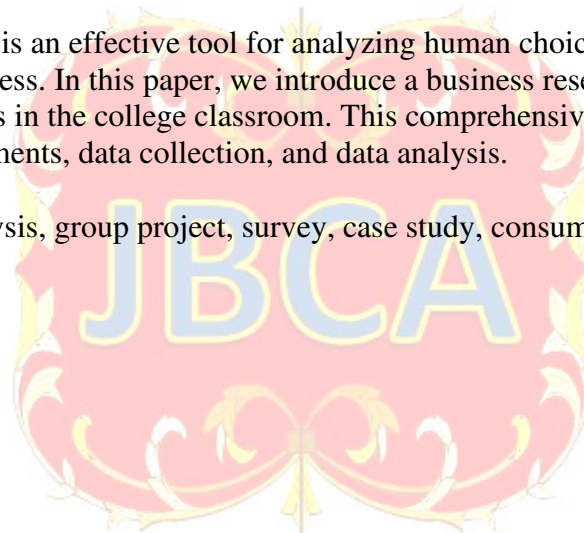
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### **ABSTRACT**

Conjoint analysis is an effective tool for analyzing human choice and preference during the decision-making process. In this paper, we introduce a business research group case study for teaching conjoint analysis in the college classroom. This comprehensive project consists of the creation of survey instruments, data collection, and data analysis.

Keywords: conjoint analysis, group project, survey, case study, consumer choice



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## INTRODUCTION

Most products, including tangible goods and intangible services, have multiple product features. For example, a laptop computer's features include its USB ports, screen, CPU, hard drive, graphics chip, etc. Each of these features may have multiple values or levels, e. g., 15-inch screen vs. 17-inch screen. Also, the seller may set different prices. So, how do these features and the price at different levels affect the consumers' choices and preferences? Can we assign some specific number to each of these features and prices? Conjoint analysis is a highly effective tool to help us answer these questions.

As a form of multivariate statistical technique, conjoint analysis has been developed and used by both academics and professional researchers for nearly 50 years. Conjoint analysis is typically conducted via a specialized survey. Analyzing the results allows the researcher to then assign a value to each feature.

When using conjoint analysis, researchers employ the idea of utility from economics and assume that consumer preference for an option (i.e. brand or seller) can be broken into separate amounts of utility for each attribute of each option. A set of profiles, each with defined values for each of the attributes, is presented to respondents. Respondents can rank or rate these profiles according to their preferences. Researchers can then use conjoint analysis to estimate the weight, or part-worth, of each of the attributes at each selected level.

There are many significant advantages to using conjoint analysis. First, it allows researchers to understand the tradeoffs that consumers make when they are examining different options with different attribute levels. Conjoint analysis may reveal unexpected or hidden factors. Second, conjoint analysis can help decision makers identify the optimal product attributes and price. Researchers can efficiently study multiple product profiles instead of just one or two. All these benefits would be hard to obtain by using the traditional survey method and other statistical techniques.

Marketing researchers have employed conjoint analysis to answer questions such as how consumer choices or preferences for a product are affected by certain features of the product (Green & Srinivasan, 1990). Other examples of the application of conjoint analysis in marketing research include pricing decisions (Kohli and Mahajan, 1991) and marketing segmentation (D'Souza and Weun, 1997). Conjoint analysis has been utilized by researchers in other areas such as economics (Farber and Griner, 2000) and management information systems (Lee and Rhim, 2014).

## CASE APPLICATION AND LEARNING OBJECTIVES

Currently, no marketing or economics textbook provides a comprehensive case project to enable students to go through the entire process of conjoint analysis. This comprehensive case is designed to teach conjoint analysis in classes in business analysis and marketing research at both the undergraduate and graduate levels. The case below is largely based on Shen et al. (2011) and aims to investigate online consumer word-of-mouth initially. However, any parts of the case, including research questions and survey questionnaire, can be easily adapted to accommodate different product categories, product features, and price.

This case study case enables students to:

1. Learn the complete process of conjoint analysis
2. Learn to design a survey questionnaire

3. Interpret the results of both ranking-based and rating-based conjoint analysis
4. Provide the managerial implications of these results

## THE CASE

### Step 1: Define the research objective.

Imagine a consumer is interested in buying a specific product, e.g., a cellphone. When he or she is browsing on an online marketplace such as Amazon, often this consumer will find many sellers offering the same brand simultaneously. While the product for sale is the same, these competing sellers are different in terms of the following three attributes:

- The total number of ratings the seller has received in the seller's lifetime
- The percentage of positive ratings the seller has received over the past 12 months
- The seller's asked price for the product

It is logical to assume that these attributes should influence the consumer's choice of the seller. This project requires students to create a survey questionnaire, collect data and perform conjoint analysis to investigate the impact of these attributes on consumers' preferences and choices.

### Step 2: Create an instrument: survey questionnaire.

Students can choose two products whose typical market prices are significantly different. For each attribute, students should determine the number of levels and the value for each level. To make the project more manageable, we recommend three levels for each attribute. Below are examples of selected products and attribute ranges for the seller profiles.

Relatively expensive product: a computer

- Number of lifetime ratings: 100,000; 5000; 30
- Percentage of positive ratings received in the past 12 months: 98%; 88%; 78%
- Asked price: 1000 dollars; 900 dollars; 800 dollars

Relatively inexpensive product: a cellphone

- Number of lifetime ratings: 100,000; 5000; 30
- Percentage of positive ratings received in the past 12 months: 98%; 88%; 78%
- Asked price: 200 dollars; 180 dollars; 160 dollars

Next, students need to create multiple seller profiles, i.e., different combinations of the attributes at different levels. They may choose a full-profile design that includes all the levels of the three attributes. However, there will be 27 seller profiles for their respondents to compare. Ranking and rating so many options may be too time-consuming and somewhat unrealistic given expected time constraints for the respondent. In most real-world market transactions, buyers are unlikely to consider so many sellers. In addition, student researchers must be able to administer the survey questionnaire in a few minutes.

It is more reasonable to choose a fractional, orthogonal design that needs a smaller number of seller profiles. Therefore, without testing all the combinations of the attribute levels, we can statistically test the main effects. The sample survey in Appendix I lists nine unique seller profiles.

SPSS from IBM is widely available on college campuses in the United States and is particularly suitable for conjoint analysis. Students can use SPSS to generate an orthogonal design by following the steps shown in Appendix II.

### **Step 3: Data collection**

Data collection requires a collective effort. Each student should collect five to ten completed questionnaires. A class of 30 students should collect more than 150 completed questionnaires. McCullough (2002) recommends that the minimum sample size for conjoint analysis should be 75. Consequently, when the class size is small, each student will need to survey more respondents. Students can either conduct the survey using an online platform or use a more traditional paper-and-pencil method. It is important to ensure the whole class uses the same questionnaire.

The sample questionnaire template in Appendix I can be adopted and manipulated to better serve different research objectives. Note the questionnaire requires respondents to rate and rank the nine seller profiles. When time or other constraints require, the task can be simplified to include either rating or ranking.

After the completion of the survey, students will work together to create a dataset using software such as Excel. In the Excel spreadsheet, the first column should list the ID numbers of the respondents and the first row lists all the ratings and rankings of the nine seller profiles.

### **Step 4: Analyze data**

Analysis of the data set could be performed either by individual students or student groups. There are many commercial software or online websites offering conjoint analysis. Students can choose to use one of them to perform the data analysis. If SPSS is used, the instructions from IBM can be found in Appendix III. Before the analysis, students will need to transform the dataset into a SPSS document first.

Upon completion of running the analysis, students will see the following information in the results of the conjoint analysis:

- Part-worth of each attribute at each level and their respective errors
- Relative importance of each attribute

Students should be asked to pay attention to the attributes or levels with higher part-worth and attributes with higher relative importance.

## **DISCUSSION QUESTIONS**

At the end of the study, students should be able to answer the following questions:

1. How does each of the three attributes affect consumers' choice of and preference for the competing sellers? Which attributes are more important?
2. For each of these attributes, which levels are the most desirable in the consumer's mind?
3. How do these attributes affect sellers of relatively inexpensive and more expensive products differently?
4. Do these attributes affect buyers' rating and ranking of the sellers differently?
5. If you are a seller with good reputation profile, could you ask buyers for higher price?
6. If the product you sell is expensive, is your reputation profile important?

7. Which is more important, total rating number ratings or percentage of positive ratings in the past 12 months?

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## APPENDIX

### Appendix I: Sample Questionnaire

Imagine you have decided to buy one product online. You browse a major retail website and find that multiple online sellers are selling exactly the same product at different prices (including shipping cost). These sellers have different reputations in terms of number of customer ratings in their history and the percentage of positive ratings over the past 12 months. You will buy only one unit of this product from one of these 9 online sellers.

For each product, please pay attention to these sellers' reputation and prices and then:

1. Rank all 9 sellers in order according to your preference. For example, after comparing the 9 sellers, if you believe the seller #1 is your first choice, write down "1" in its corresponding cell; if you believe the seller #5 is your second choice, write down "2" in its corresponding cell, etc.

2. Rate all 9 sellers according to your preference on an eleven-point scale where 11 means "highly favorable" and 1 means "highly unfavorable".

For this survey you are invited to rate and rank sellers for two different products.

#### Task #1: to buy one new laptop from one of these 9 sellers

| Seller Profile | Number of ratings in entire selling history | Positive Rating over the past 12 months | Price (including shipping) | Rank these sellers from 1 to 9 with 1 being the first choice and 9 the last choice | Rate your preference of these sellers (Circle one)<br>1: highly unfavorable;<br>11: highly favorable |
|----------------|---|---|----------------------------|--|--|
| #1             | 100,000                                     | 98%                                     | \$ 1,000                   |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #2             | 100,000                                     | 88%                                     | \$ 900                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #3             | 100,000                                     | 78%                                     | \$ 800                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #4             | 5,000                                       | 98%                                     | \$ 900                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #5             | 5,000                                       | 88%                                     | \$ 800                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #6             | 5,000                                       | 78%                                     | \$ 1,000                   |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #7             | 30  | 98%                                     | \$ 800                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #8             | 30  | 88%                                     | \$ 1,000                   |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #9             | 30  | 78%                                     | \$ 900                     |  | 1 2 3 4 5 6 7 8 9 10 11  |

**Task #2: to buy one cellphone from one of these 9 sellers**

| Seller Profile | Number of ratings in entire selling history | Positive Rating over the past 12 months | Price (including shipping) | Rank these sellers from 1 to 9 with 1 being the first choice and 9 the last choice | Rate your preference of these sellers (Circle one)<br>1: highly unfavorable;<br>11: highly favorable |
|----------------|---|---|----------------------------|--|--|
| #1             | 100,000                                     | 98%                                     | \$ 200                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #2             | 100,000                                     | 88%                                     | \$ 180                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #3             | 100,000                                     | 78%                                     | \$ 160                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #4             | 5,000                                       | 98%                                     | \$ 180                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #5             | 5,000                                       | 88%                                     | \$ 160                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #6             | 5,000                                       | 78%                                     | \$ 200                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #7             | 30  | 98%                                     | \$ 160                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #8             | 30  | 88%                                     | \$ 200                     |  | 1 2 3 4 5 6 7 8 9 10 11  |
| #9             | 30  | 78%                                     | \$ 180                     |  | 1 2 3 4 5 6 7 8 9 10 11  |



## Appendix II: Use SPSS to Generate an Orthogonal Design

As described in IBM SPSS Conjoint 28:

1. From the menus choose: Data > Orthogonal Design > Generate...
2. Define at least one factor. Enter a name in the Factor Name text box. Factor names can be any valid variable name, except status\_ or card\_. You can also assign an optional factor label.
3. Click Add to add the factor name and an optional label. To delete a factor, select it in the list and click Remove. To modify a factor name or label, select it in the list, modify the name or label, and click Change.
4. Define values for each factor by selecting the factor and clicking Define Values.

## Appendix III: Running a Conjoint Analysis on SPSS

As described in IBM SPSS Conjoint 28, to obtain a conjoint analysis, you must enter command syntax for a CONJOINT command into a syntax window and then run it.

To Run a Command from a Syntax Window

From the menus choose: File > New > Syntax...

This opens a syntax window.

1. Enter the command syntax for the CONJOINT command.
2. Highlight the command in the syntax window and click the Run button (the right-pointing triangle) on the Syntax Editor toolbar.

