Chapter Twenty-One

Multidimensional Scaling and Conjoint Analysis

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Multidimensional Scaling (MDS)

- **Multidimensional scaling (MDS)** is a class of procedures for representing perceptions and preferences of respondents spatially by means of a visual display.
- Perceived or psychological relationships among stimuli are represented as geometric relationships among points in a multidimensional space.
- These geometric representations are often called spatial maps. The axes of the spatial map are assumed to denote the psychological bases or underlying dimensions respondents use to form perceptions and preferences for stimuli.
Statistics and Terms Associated with MDS

- **Similarity judgments.** Similarity judgments are ratings on all possible pairs of brands or other stimuli in terms of their similarity using a Likert-type scale.

- **Preference rankings.** Preference rankings are rank orderings of the brands or other stimuli from the most preferred to the least preferred. They are normally obtained from the respondents.

- **Stress.** This is a lack-of-fit measure; higher values of stress indicate poorer fits.

- **R-square.** R-square is a squared correlation index that indicates the proportion of variance of the optimally scaled data that can be accounted for by the MDS procedure. This is a goodness-of-fit measure.

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Statistics and Terms Associated with MDS

- **Spatial map.** Perceived relationships among brands or other stimuli are represented as geometric relationships among points in a multidimensional space called a spatial map.

- **Coordinates.** Coordinates indicate the positioning of a brand or a stimulus in a spatial map.

- **Unfolding.** The representation of both brands and respondents as points in the same space is referred to as unfolding.
Conducting Multidimensional Scaling

**Conducting Multidimensional Scaling**

**Formulate the Problem**

- Specify the purpose for which the MDS results would be used.
- Select the brands or other stimuli to be included in the analysis. The number of brands or stimuli selected normally varies between 8 and 25.
- The choice of the number and specific brands or stimuli to be included should be based on the statement of the marketing research problem, theory, and the judgment of the researcher.
Input Data for Multidimensional Scaling

Fig. 21.2

MDS Input Data

Perceptions

Preferences

Direct (Similarity Judgments)

Derived (Attribute Ratings)

Conducting Multidimensional Scaling: Obtain Input Data

- **Perception Data: Direct Approaches.** In direct approaches to gathering perception data, the respondents are asked to judge how similar or dissimilar the various brands or stimuli are, using their own criteria. These data are referred to as similarity judgments.

<table>
<thead>
<tr>
<th></th>
<th>Very Dissimilar</th>
<th></th>
<th>Very Similar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crest vs. Colgate</td>
<td>1 2 3 4 5 6 7</td>
<td>Aqua-Fresh vs. Crest</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Crest vs. Aim</td>
<td>. . . . . . . .</td>
<td>. . . . . . . .</td>
<td>. . . . . . . .</td>
</tr>
<tr>
<td>Colgate vs. Aqua-Fresh</td>
<td>1 2 3 4 5 6 7</td>
<td>. . . . . . . .</td>
<td>. . . . . . . .</td>
</tr>
</tbody>
</table>

- The number of pairs to be evaluated is \( n(n-1)/2 \), where \( n \) is the number of stimuli.
Similarity Rating Of Toothpaste Brands

Table 21.1

<table>
<thead>
<tr>
<th></th>
<th>Aqua-Fresh</th>
<th>Crest</th>
<th>Colgate</th>
<th>Aim</th>
<th>Gleem</th>
<th>Plus White</th>
<th>Ultra Brite</th>
<th>Close-Up</th>
<th>Pepaident</th>
<th>Sensodyne</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqua-Fresh</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Crest</td>
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<td>6</td>
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<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Colgate</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Aim</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>3</td>
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<td>1</td>
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<tr>
<td>Gleem</td>
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<td>3</td>
<td>4</td>
<td>5</td>
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<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Plus White</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ultra Brite</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Close-Up</td>
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<td>3</td>
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<td>Sensodyne</td>
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<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
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</tr>
</tbody>
</table>

Conducting Multidimensional Scaling: Obtain Input Data

- **Perception Data: Derived Approaches.** Derived approaches to collecting perception data are attribute-based approaches requiring the respondents to rate the brands or stimuli on the identified attributes using semantic differential or Likert scales.

<table>
<thead>
<tr>
<th>Whitens teeth</th>
<th>...</th>
<th>...</th>
<th>...</th>
<th>...</th>
<th>...</th>
<th>...</th>
<th>...</th>
<th>...</th>
<th>...</th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevents tooth decay</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Pleasant tasting</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

- If attribute ratings are obtained, a similarity measure (such as Euclidean distance) is derived for each pair of brands.
Conducting Multidimensional Scaling: Obtain Input Data – Direct Vs. Derived Approaches

The direct approach has the following advantages and disadvantages:

- The researcher does not have to identify a set of salient attributes.
- The disadvantages are that the criteria are influenced by the brands or stimuli being evaluated.
- Furthermore, it may be difficult to label the dimensions of the spatial map.

Conducting Multidimensional Scaling: Obtain Input Data – Direct Vs. Derived Approaches

The attribute-based approach has the following advantages and disadvantages:

- It is easy to identify respondents with homogeneous perceptions.
- The respondents can be clustered based on the attribute ratings.
- It is also easier to label the dimensions.
- A disadvantage is that the researcher must identify all the salient attributes, a difficult task.
- The spatial map obtained depends upon the attributes identified.
  It may be best to use both these approaches in a complementary way. Direct similarity judgments may be used for obtaining the spatial map, and attribute ratings may be used as an aid to interpreting the dimensions of the perceptual map.
Conducting Multidimensional Scaling: Preference Data

- Preference data order the brands or stimuli in terms of respondents' preference for some property.
- A common way in which such data are obtained is through preference rankings.
- Alternatively, respondents may be required to make paired comparisons and indicate which brand in a pair they prefer.
- Another method is to obtain preference ratings for the various brands.
- The configuration derived from preference data may differ greatly from that obtained from similarity data. Two brands may be perceived as different in a similarity map yet similar in a preference map, and vice versa.

Conducting Multidimensional Scaling: Select an MDS Procedure

Selection of a specific MDS procedure depends upon:

- Whether perception or preference data are being scaled, or whether the analysis requires both kinds of data.
- The nature of the input data is also a determining factor.
  - Non-metric MDS procedures assume that the input data are ordinal, but they result in metric output.
  - Metric MDS methods assume that input data are metric. Since the output is also metric, a stronger relationship between the output and input data is maintained, and the metric (interval or ratio) qualities of the input data are preserved.
  - The metric and non-metric methods produce similar results.
- Another factor influencing the selection of a procedure is whether the MDS analysis will be conducted at the individual respondent level or at an aggregate level.
Conducting Multidimensional Scaling: Decide on the Number of Dimensions

- **A priori knowledge** - Theory or past research may suggest a particular number of dimensions.
- **Interpretability of the spatial map** - Generally, it is difficult to interpret configurations or maps derived in more than three dimensions.
- **Elbow criterion** - A plot of stress versus dimensionality should be examined.
- **Ease of use** - It is generally easier to work with two-dimensional maps or configurations than with those involving more dimensions.
- **Statistical approaches** - For the sophisticated user, statistical approaches are also available for determining the dimensionality.

Plot of Stress Versus Dimensionality

Fig. 21.3
Conducting Multidimensional Scaling:
Label the Dimensions and Interpret the Configuration

- Even if direct similarity judgments are obtained, ratings of the brands on researcher-supplied attributes may still be collected. Using statistical methods such as regression, these attribute vectors may be fitted in the spatial map.
- After providing direct similarity or preference data, the respondents may be asked to indicate the criteria they used in making their evaluations.
- If possible, the respondents can be shown their spatial maps and asked to label the dimensions by inspecting the configurations.
- If objective characteristics of the brands are available (e.g., horsepower or miles per gallon for automobiles), these could be used as an aid in interpreting the subjective dimensions of the spatial maps.

A Spatial Map of Toothpaste Brands

Fig. 21.4
Using Attribute Vectors to Label Dimensions

Fig. 21.5

Conducting Multidimensional Scaling: Assess Reliability and Validity

- The **index of fit**, or *R-square* is a squared correlation index that indicates the proportion of variance of the optimally scaled data that can be accounted for by the MDS procedure. Values of 0.60 or better are considered acceptable.
- **Stress values** are also indicative of the quality of MDS solutions. While *R-square* is a measure of goodness-of-fit, stress measures badness-of-fit, or the proportion of variance of the optimally scaled data that is not accounted for by the MDS model. Stress values of less than 10% are considered acceptable.
- If an aggregate-level analysis has been done, the original data should be split into two or more parts. MDS analysis should be conducted separately on each part and the results compared.
Conducting Multidimensional Scaling: Assess Reliability and Validity

- Stimuli can be selectively eliminated from the input data and the solutions determined for the remaining stimuli.

- A random error term could be added to the input data. The resulting data are subjected to MDS analysis and the solutions compared.

- The input data could be collected at two different points in time and the test-retest reliability determined.

Assessment of Stability by Deleting One Brand

Fig. 21.6
External Analysis of Preference Data

Assumptions and Limitations of MDS

- It is assumed that the similarity of stimulus A to B is the same as the similarity of stimulus B to A.
- MDS assumes that the distance (similarity) between two stimuli is some function of their partial similarities on each of several perceptual dimensions.
- When a spatial map is obtained, it is assumed that interpoint distances are ratio scaled and that the axes of the map are multidimensional interval scaled.
- A limitation of MDS is that dimension interpretation relating physical changes in brands or stimuli to changes in the perceptual map is difficult at best.
Scaling Preference Data

- In **internal analysis of preferences**, a spatial map representing both brands or stimuli and respondent points or vectors is derived solely from the preference data.
- In **external analysis of preferences**, the ideal points or vectors based on preference data are fitted in a spatial map derived from perception (e.g., similarities) data.
- The representation of both brands and respondents as points in the same space, by using internal or external analysis, is referred to as **unfolding**.
- External analysis is preferred in most situations.

Conjoint Analysis

- **Conjoint analysis** attempts to determine the relative importance consumers attach to salient attributes and the utilities they attach to the levels of attributes.
- The respondents are presented with stimuli that consist of combinations of attribute levels and asked to evaluate these stimuli in terms of their desirability.
- Conjoint procedures attempt to assign values to the levels of each attribute, so that the resulting values or utilities attached to the stimuli match, as closely as possible, the input evaluations provided by the respondents.
Statistics and Terms Associated with Conjoint Analysis

- **Part-worth functions.** The part-worth functions, or utility functions, describe the utility consumers attach to the levels of each attribute.

- **Relative importance weights.** The relative importance weights are estimated and indicate which attributes are important in influencing consumer choice.

- **Attribute levels.** The attribute levels denote the values assumed by the attributes.

- **Full profiles.** Full profiles, or complete profiles of brands, are constructed in terms of all the attributes by using the attribute levels specified by the design.

- **Pairwise tables.** In pairwise tables, the respondents evaluate two attributes at a time until all the required pairs of attributes have been evaluated.

Statistics and Terms Associated with Conjoint Analysis

- **Cyclical designs.** Cyclical designs are designs employed to reduce the number of paired comparisons.

- **Fractional factorial designs.** Fractional factorial designs are designs employed to reduce the number of stimulus profiles to be evaluated in the full profile approach.

- **Orthogonal arrays.** Orthogonal arrays are a special class of fractional designs that enable the efficient estimation of all main effects.

- **Internal validity.** This involves correlations of the predicted evaluations for the holdout or validation stimuli with those obtained from the respondents.
Conducting Conjoint Analysis:
Formulate the Problem

- Identify the attributes and attribute levels to be used in constructing the stimuli.
- The attributes selected should be salient in influencing consumer preference and choice and should be actionable.
- A typical conjoint analysis study involves six or seven attributes.
- At least three levels should be used, unless the attribute naturally occurs in binary form (two levels).
- The researcher should take into account the attribute levels prevalent in the marketplace and the objectives of the study.
Conducting Conjoint Analysis: Construct the Stimuli

- In the **pairwise approach**, also called *two-factor evaluations*, the respondents evaluate two attributes at a time until all the possible pairs of attributes have been evaluated.

- In the **full-profile approach**, also called *multiple-factor evaluations*, full or complete profiles of brands are constructed for all the attributes. Typically, each profile is described on a separate index card.

- In the pairwise approach, it is possible to reduce the number of paired comparisons by using cyclical designs. Likewise, in the full-profile approach, the number of stimulus profiles can be greatly reduced by means of fractional factorial designs.

Sneaker Attributes and Levels

Table 21.2

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sole</td>
<td>3</td>
<td>Rubber</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Polyurethane</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Plastic</td>
</tr>
<tr>
<td>Upper</td>
<td>3</td>
<td>Leather</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Canvas</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Nylon</td>
</tr>
<tr>
<td>Price</td>
<td>3</td>
<td>$30.00</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>$60.00</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>$90.00</td>
</tr>
</tbody>
</table>
Full-Profile Approach to Collecting Conjoint Data

Table 21.3

Example of a Sneaker Product Profile

<table>
<thead>
<tr>
<th>Sole</th>
<th>Made of rubber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td>Made of nylon</td>
</tr>
<tr>
<td>Price</td>
<td>$30.00</td>
</tr>
</tbody>
</table>

Pairwise Approach to Conjoint Data

Fig. 21.9
Conducting Conjoint Analysis: Construct the Stimuli

- A special class of fractional designs, called orthogonal arrays, allow for the efficient estimation of all main effects. **Orthogonal arrays** permit the measurement of all main effects of interest on an uncorrelated basis. These designs assume that all interactions are negligible.

- Generally, two sets of data are obtained. One, the *estimation set*, is used to calculate the part-worth functions for the attribute levels. The other, the *holdout set*, is used to assess reliability and validity.

Conducting Conjoint Analysis: Decide on the Form of Input Data

- For non-metric data, the respondents are typically required to provide rank-order evaluations.
- In the metric form, the respondents provide ratings, rather than rankings. In this case, the judgments are typically made independently.
- In recent years, the use of ratings has become increasingly common.
- The dependent variable is usually preference or intention to buy. However, the conjoint methodology is flexible and can accommodate a range of other dependent variables, including actual purchase or choice.
- In evaluating sneaker profiles, respondents were required to provide preference.
### Sneaker Profiles and Ratings

Table 21.4

<table>
<thead>
<tr>
<th>Profile No.</th>
<th>Sole</th>
<th>Upper</th>
<th>Price</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
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<td>3</td>
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<td>6</td>
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<td>7</td>
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<td>8</td>
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<td>1</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

*The attribute levels correspond to those in Table 21.2.*

---

### Conducting Conjoint Analysis:

**Conjoint Analysis Model**

The basic conjoint analysis model may be represented by the following formula:

\[
U(X) = \sum_{i=1}^{m} \sum_{j=1}^{k_i} \alpha_{ij} x_{ij}
\]

Where:

- \( U(X) \) = overall utility of an alternative
- \( \alpha_{ij} \) = the part-worth contribution or utility associated with the \( j \) th level \((j, j = 1, 2, \ldots k_j)\) of the \( i \) th attribute \((i, i = 1, 2, \ldots m)\)
- \( x_{ij} \) = 1 if the \( j \) th level of the \( i \) th attribute is present = 0 otherwise
- \( k_i \) = number of levels of attribute \( i \)
- \( m \) = number of attributes
Conducting Conjoint Analysis:
Relative Importance

The importance of an attribute, \( I_i \), is defined in terms of the range of the part-worths, \( G_{ij} \), across the levels of that attribute:

\[
I_i = \sum \frac{G_{ij}}{m_i}
\]

The attribute's importance is normalized to ascertain its importance relative to other attributes, \( W_i \):

\[
W_i = \frac{I_i}{\sum I_i}
\]

So that \( \sum W_i = 1 \)

The simplest estimation procedure, and one which is gaining in popularity, is dummy variable regression (see Chapter 17). If an attribute has \( k_i \) levels, it is coded in terms of \( k_i - 1 \) dummy variables (see Chapter 14).

Other procedures that are appropriate for non-metric data include LINMAP, MONANOVA, and the LOGIT model.

Conducting Conjoint Analysis:
Estimating the Conjoint Model

The model estimated may be represented as:

\[
U = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6
\]

Where:

\( X_1, X_2 \) = dummy variables representing Sole
\( X_3, X_4 \) = dummy variables representing Upper
\( X_5, X_6 \) = dummy variables representing Price

For Sole, the attribute levels were coded as follows:

<table>
<thead>
<tr>
<th>Level</th>
<th>( X_1 )</th>
<th>( X_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Level 2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Level 3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
### Sneaker Data Coded for Dummy Variable Regression

**Table 21.5**

<table>
<thead>
<tr>
<th>Preference Ratings</th>
<th>Sole X1</th>
<th>Upper X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
<th>X6</th>
</tr>
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<tbody>
<tr>
<td>Y</td>
<td>X1</td>
<td>X2</td>
<td>X3</td>
<td>X4</td>
<td>X5</td>
<td>X6</td>
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<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Conducting Conjoint Analysis: Estimation of Parameters

The levels of the other attributes were coded similarly. The parameters were estimated as follows:

\[
\begin{align*}
    b_0 &= 4.222 \\
    b_1 &= 1.000 \\
    b_2 &= -0.333 \\
    b_3 &= 1.000 \\
    b_4 &= 0.667 \\
    b_5 &= 2.333 \\
    b_6 &= 1.333
\end{align*}
\]

Given the dummy variable coding, in which level 3 is the base level, the coefficients may be related to the part-worths:

\[
\begin{align*}
    \alpha_{11} - \alpha_{13} &= b_1 \\
    \alpha_{12} - \alpha_{13} &= b_2
\end{align*}
\]
Conducting Conjoint Analysis: Calculation of Part-Worths

To solve for the part-worths, an additional constraint is necessary.
\[ \alpha_{11} + \alpha_{12} + \alpha_{13} = 0 \]

These equations for the first attribute, Sole, are:
\[ \alpha_{11} - \alpha_{13} = 1.000 \]
\[ \alpha_{12} - \alpha_{13} = -0.333 \]
\[ \alpha_{11} + \alpha_{12} + \alpha_{13} = 0 \]

Solving these equations, we get:
\[ \alpha_{11} = 0.778 \]
\[ \alpha_{12} = -0.556 \]
\[ \alpha_{13} = -0.222 \]

Conducting Conjoint Analysis: Calculation of Part-Worths

The part-worths for other attributes reported in Table 21.6 can be estimated similarly.

For Upper, we have:
\[ \alpha_{21} - \alpha_{23} = b_3 \]
\[ \alpha_{22} - \alpha_{23} = b_4 \]
\[ \alpha_{21} + \alpha_{22} + \alpha_{23} = 0 \]

For the third attribute, Price, we have:
\[ \alpha_{31} - \alpha_{33} = b_5 \]
\[ \alpha_{32} - \alpha_{33} = b_6 \]
\[ \alpha_{31} + \alpha_{32} + \alpha_{33} = 0 \]
Conducting Conjoint Analysis Decide:
Calculation of Relative Importance

The **relative importance** weights were calculated based on ranges of part-worths, as follows:

\[
\text{Sum of ranges of part-worths} = (0.778 - (-0.556)) + (0.445 - (-0.556)) + (1.111 - (-1.222))
\]

\[
= 4.668
\]

Relative importance of Sole = \( \frac{1.334}{4.668} = 0.286 \)

Relative importance of Upper = \( \frac{1.001}{4.668} = 0.214 \)

Relative importance of Price = \( \frac{2.333}{4.668} = 0.500 \)

Results of Conjoint Analysis

<table>
<thead>
<tr>
<th>Level</th>
<th>Attribute No.</th>
<th>Description</th>
<th>Utility</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Rubber</td>
<td>0.778</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Polyurethane</td>
<td>-0.556</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Plastic</td>
<td>-0.222</td>
<td></td>
<td>0.286</td>
</tr>
<tr>
<td></td>
<td>Upper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Leather</td>
<td>0.445</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Canvas</td>
<td>0.111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Nylon</td>
<td>-0.556</td>
<td></td>
<td>0.214</td>
</tr>
<tr>
<td></td>
<td>Price</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$30.00</td>
<td>1.111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>$60.00</td>
<td>0.111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>$90.00</td>
<td>-1.222</td>
<td></td>
<td>0.500</td>
</tr>
</tbody>
</table>
Conducting Conjoint Analysis: Interpret the Results

- For interpreting the results, it is helpful to plot the part-worth functions.
- The utility values have only interval scale properties, and their origin is arbitrary.
- The relative importance of attributes should be considered.

Conducting Conjoint Analysis: Assessing Reliability and Validity

- The goodness of fit of the estimated model should be evaluated. For example, if dummy variable regression is used, the value of $R^2$ will indicate the extent to which the model fits the data.
- Test-retest reliability can be assessed by obtaining a few replicated judgments later in data collection.
- The evaluations for the holdout or validation stimuli can be predicted by the estimated part-worth functions. The predicted evaluations can then be correlated with those obtained from the respondents to determine internal validity.
- If an aggregate-level analysis has been conducted, the estimation sample can be split in several ways and conjoint analysis conducted on each subsample. The results can be compared across subsamples to assess the stability of conjoint analysis solutions.
**Assumptions and Limitations of Conjoint Analysis**

- Conjoint analysis assumes that the important attributes of a product can be identified.
- It assumes that consumers evaluate the choice alternatives in terms of these attributes and make tradeoffs.
- The tradeoff model may not be a good representation of the choice process.
- Another limitation is that data collection may be complex, particularly if a large number of attributes are involved and the model must be estimated at the individual level.
- The part-worth functions are not unique.
Chapter Twenty-Three

Report Preparation and Presentation

Chapter Outline

1) Overview
2) Importance of the Report and Presentation
3) The Report Preparation and Presentation Process
4) Report Preparation
   i. Report Format
   ii. Report Writing
   iii. Guidelines for Tables
   iv. Guidelines for Graphs
5) Oral Presentation
Chapter Outline

6) Reading the Research Report
   i. Addresses the Problem
   ii. Research Design
   iii. Execution of the Research Procedures
   iv. Numbers and Statistics
   v. Interpretations and Conclusions
   vi. Generalizability
   vii. Disclosure

7) Research Follow-Up
   i. Assisting the Client
   ii. Evaluation of the Research Process

Chapter Outline

8) International Market Research

9) Ethics in Market Research

10) Summary
Importance of the Report and Presentation

For the following reasons, the report and its presentation are important parts of the marketing research project:

1. They are the tangible products of the research effort.
2. Management decisions are guided by the report and the presentation.
3. The involvement of many marketing managers in the project is limited to the written report and the oral presentation.
4. Management's decision to undertake marketing research in the future or to use the particular research supplier again will be influenced by the perceived usefulness of the report and the presentation.

The Report Preparation and Presentation Process

Fig. 23.1

- Problem Definition, Approach, Research Design, and Fieldwork
- Data Analysis
- Interpretations, Conclusions, and Recommendations
- Report Preparation
- Oral Presentation
- Reading of the Report by the Client
- Research Follow-Up
Report Format

I. Title page
II. Letter of transmittal
III. Letter of authorization
IV. Table of contents
V. List of tables
VI. List of graphs
VII. List of appendices
VIII. List of exhibits
IX. Executive summary
   a. Major findings
   b. Conclusions
   c. Recommendations
X. Problem definition
   a. Background to the problem
   b. Statement of the problem
XI. Approach to the problem
XII. Research design
   a. Type of research design
   b. Information needs
   c. Data collection from secondary sources
   d. Data collection from primary sources
   e. Scaling techniques
   f. Questionnaire development and pretesting
   g. Sampling techniques
   h. Fieldwork
Report Format

XIII. Data analysis
   a. Methodology
   b. Plan of data analysis

XIV. Results

XV. Limitations and caveats

XVI. Conclusions and recommendations

XVII. Exhibits
   a. Questionnaires and forms
   b. Statistical output
   c. Lists

TNS-Global Guidelines: Title Page

Use client language in title – avoid "research-eze."

- "Practices Followed in Selecting Long-Distance Carriers" is better than "Long-Distance Service Study."

- "Customers' Reactions to an Expanded Financial/Insurance Relationship" is better than "Relationship Study."

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Conclusions concerning, for example:
- customer behavior
- customer attitudes or perceptions
- the nature of the markets studied

Generally, in studies with samples designed to represent the market. Avoid interesting results that are not relevant to the conclusions.

- May be in the form of statement or paragraphs
- Use subheadings to identify conclusions covering different subjects or market segments

Recommendations regarding actions that should be taken or considered in light of the research results:
- Add/drop a product
- What to say in advertising—advertising positioning
- Market segments to select as primary targets
- How to price product
- Further research that should be considered

Should be related to the stated purpose of the research.

Sometimes omitted, for example:
- Client staff members want to author the recommendations
- Study designed merely to familiarize client with a market

Most clients are interested in our suggestions, in spite of the fact that we may not be familiar with internal financial issues and other internal corporate factors.
Report Writing

• **Readers.** A report should be written for a specific reader or readers: the marketing managers who will use the results.

• **Easy to follow.** The report should be easy to follow. It should be structured logically and written clearly.

• **Presentable and professional appearance.** The look of a report is important.

• **Objective.** Objectivity is a virtue that should guide report writing. The rule is, "Tell it like it is."

• **Reinforce text with tables and graphs.** It is important to reinforce key information in the text with tables, graphs, pictures, maps, and other visual devices.

• **Terse.** A report should be terse and concise. Yet, brevity should not be achieved at the expense of completeness.

Guidelines for Tables

• **Title and number.** Every table should have a number (1a) and title (1b).

• **Arrangement of data items.** The arrangement of data items in a table should emphasize the most significant aspect of the data.

• **Basis of measurement.** The basis or unit of measurement should be clearly stated (3a).

• **Leaders, rulings, spaces.** Leaders, dots or hyphens used to lead the eye horizontally, impart uniformity and improve readability (4a). Instead of ruling the table horizontally or vertically, white spaces (4b) are used to set off data items. Skipping lines after different sections of the data can also assist the eye. Horizontal rules (4c) are often used after the headings.

• **Explanations and comments: Headings, stubs, and footnotes.** Designations placed over the vertical columns are called headings (5a). Designations placed in the left-hand column are called stubs (5b). Information that cannot be incorporated in the table should be explained by footnotes (5c).

• **Sources of the data.** If the data contained in the table are secondary, the source of data should be cited (6a).

Guidelines for Graphs: Geographic and Other Maps

- **Geographic maps** can pertain to countries, states, counties, sales territories, and other divisions.

- Chapter 21 shows examples of **product-positioning maps**.
Guidelines for Graphs: Round or Pie Charts

- In a **pie chart**, the area of each section, as a percentage of the total area of the circle, reflects the percentage associated with the value of a specific variable.

- A pie chart is not useful for displaying relationships over time or relationships among several variables.

- As a general guideline, a pie chart should not require more than seven sections.

Pie Chart of 2007 U.S. Auto Sales

Fig. 23.2
Guidelines for Graphs: Line Charts

- A **line chart** connects a series of data points using continuous lines.
- This is an attractive way of illustrating trends and changes over time.
- Several series can be compared on the same chart, and forecasts, interpolations, and extrapolations can be shown.

Line Chart of Total U.S. Auto Sales

Fig. 23.3
Guidelines for Graphs: Line Charts

- A **stratum chart** is a set of line charts in which the data are successively aggregated over the series.
- Areas between the line charts display the magnitudes of the relevant variables.

---

Stratum Chart of Total U.S. Auto Sales

![Fig. 23.4 Stratum Chart of Total U.S. Auto Sales](chart.png)
Guidelines for Graphs: Pictographs

- A **pictograph** uses small pictures or symbols to display the data.

- Pictographs do not depict results precisely. Hence, caution should be exercised when using them.

---

Pictograph for 2007 U.S. Auto Sales

*Each Symbol Equals 1,000,000 Units*
Guidelines for Graphs: Histograms and Bar Charts

- A **bar chart** displays data in various bars that may be positioned horizontally or vertically.

- The **histogram** is a vertical bar chart in which the height of the bars represents the relative or cumulative frequency of occurrence of a specific variable.

---

Histogram of 2007 U.S. Auto Sales

Figure 23.6

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Guidelines for Graphs: Schematic Figures and Flow Charts

- **Schematic figures** and **flow charts** take on a number of different forms. They can be used to display the steps or components of a process, as in Figure 22.1.

- Another useful form of these charts is a **classification diagram**. Examples of classification charts for classifying secondary data were provided in Chapter 4 (Figures 4.1 to 4.4).

- An example of a flow chart for questionnaire design was given in Chapter 10 (Figure 10.2).

Oral Presentation

- The key to an effective presentation is preparation.
- A written script or detailed outline should be prepared following the format of the written report.
- The presentation must be geared to the audience.
- The presentation should be rehearsed several times before it is made to the management.
- Visual aids, such as tables and graphs, should be displayed with a variety of media.
- It is important to maintain eye contact and interact with the audience during the presentation.
Oral Presentation

- Filler words like "uh," "y'know," and "all right," should not be used.
- The "Tell 'Em" principle is effective for structuring a presentation.
- Another useful guideline is the "KISS 'Em" principle, which states: Keep It Simple and Straightforward (hence the acronym KISS).
- Body language should be employed.
- The speaker should vary the volume, pitch, voice quality, articulation, and rate while speaking.
- The presentation should terminate with a strong closing.

Reading the Research Report

- **Addresses the Problem** – The problem being addressed should be clearly identified and the relevant background information provided.
- The research design should be clearly described in non-technical terms.
- **Execution of the Research Procedures** – The reader should pay special attention to the manner in which the research procedures were executed.
- **Numbers and statistics** reported in tables and graphs should be examined carefully by the reader.
Reading the Research Report

- **Interpretation and Conclusions** – The interpretation of the basic results should be differentiated from the results per se. Any conclusions or recommendations made without a specification of the underlying assumptions or limitations should be treated cautiously by the reader.

- **Generalizability** – It is the responsibility of the researcher to provide evidence regarding the reliability, validity, and generalizability of the findings.

- **Disclosure** – The reader should carefully examine whether the spirit in which the report was written indicates an honest and complete disclosure of the research procedures and results.

Research Follow-up

- **Assisting the Client** – The researcher should answer questions that may arise and help the client to implement the findings.

- **Evaluation of the Research Project** – Every marketing research project provides an opportunity for learning and the researcher should critically evaluate the entire project to obtain new insights and knowledge.
Chapter Twenty-Four

International Marketing Research

Chapter Outline

1) Overview
2) Marketing Research goes International
3) A Framework for International Marketing Research
   i. The Environment
   ii. Marketing Environment
   iii. Government Environment
   iv. Legal Environment
   v. Economic Environment
   vi. Structural Environment
   vii. Informational & Technological Environment
   viii. Socio-Cultural Environment
Survey Methods: Telephone Interviewing and CATI

- In the United States and Canada, telephone interviewing is the dominant mode of questionnaire administration. The same situation exists in some European countries, such as Sweden and the Netherlands.

- In many other European countries, such as Great Britain, Finland, and Portugal, telephone interviewing is not the most popular method.

- In Hong Kong, 96% of households can be contacted by telephone. Yet, given the culture, this is not the most important mode of data collection.

- In developing countries, only a few households have telephones. Telephone directories tend to be incomplete and outdated. In many cultures, face-to-face relationships are predominant. These factors severely limit the use of telephone interviewing.

- Telephone interviews are most useful with relatively upscale consumers who are accustomed to business transactions by phone or consumers who can be reached by phone and can express themselves easily.

Survey Methods: In-Home Personal Interviews

- Due to high cost, the use of in-home personal interviews has declined in the United States and Canada, but this is the dominant mode of collecting survey data in many parts of Europe (e.g., Switzerland and Portugal) and the developing world.

- The majority of the surveys are done door-to-door, while some quick sociopolitical polls are carried out on the street using accidental routes.
Survey Methods: Mall Intercept and CAPI

- **Mall intercepts** constitute about 15% of the interviews in Canada and 20% in the United States.

- While mall intercepts are being conducted in some European countries, such as Sweden, they are not popular in Europe or developing countries.

- In contrast, **central location/street interviews** constitute the dominant method of collecting survey data in France and the Netherlands.

- However, some interesting developments with respect to **computer-assisted personal interviewing (CAPI)** are taking place in Europe.

Survey Methods: Mail Interviews

- Because of low cost, **mail interviews** continue to be used in most developed countries where literacy is high and the postal system is well developed.

- Mail interviews constitute 6.2% of the interviews in Canada and 7% in the United States. In countries where the educational level of the population is extremely high (Denmark, Finland, Iceland, Norway, Sweden, and the Netherlands), mail interviews are common.

- In Africa, Asia, and South America, however, the use of mail surveys and mail panels is low because of illiteracy and the large proportion of population living in rural areas.

- Mail surveys are typically more effective in industrial international marketing research, although it is difficult to identify the appropriate respondent within each firm and to personalize the address.
Survey Methods: Mail and Scanner Panels

- **Mail panels** are extensively used in the UK, France, West Germany, and the Netherlands. Mail and diary panels are also available in Finland, Sweden, Italy, Spain, and other European countries.

- Use of **scanner panels** may increase with the advent of new technology. For example, in Germany, two agencies (A. C. Nielsen and GfK-Nurnberg) have installed fully electronic scanner test markets, based on the Behavior Scan model from the United States. Nielsen will use on-the-air television; GfK, cable.

Survey Methods: Electronic Surveys

- In the U.S. and Canada, the use of **e-mail** and the **Internet surveys** is growing not only with business and institutional respondents but also with households.

- The popularity of both e-mail and Internet surveys is also growing overseas. Both these types of surveys are increasingly being used in Western Europe where the access to the Internet is freely available.

- However, in some parts of Eastern Europe and in other developing countries, e-mail access is restricted and Internet availability is even poorer. Hence, these methods are not suitable for surveying the general population in these countries.

- Multinational firms are using both e-mail and the Internet to survey their employees worldwide.

- An important consideration in selecting the methods of administering questionnaires is to ensure equivalence and comparability across countries.
Measurement and Scaling

- **Construct equivalence** concerns whether the marketing constructs have the same meaning and significance in different countries. Construct equivalence is comprised of conceptual equivalence, functional equivalence, and category equivalence.

- **Conceptual equivalence** deals with the interpretation of brands, products, consumer behavior, and marketing effort, e.g., special sales.

- **Functional equivalence** examines whether a given concept or behavior serves the same role or function in different countries, e.g., bicycles.

- **Category equivalence** refers to the category in which stimuli like products, brands, and behaviors are grouped, e.g., principal shopper.
Measurement and Scaling

- **Measurement equivalence** concerns the comparability of responses to particular (sets of) items. It comprises of configural, metric, and scalar equivalence.

- **Configural equivalence** concerns the relationships of measured items to the latent constructs; the patterns of factor loadings should be the same.

- **Metric equivalence** refers to the unit of measurement; the factor loadings should be the same.

- **Scalar equivalence** refers to both the unit of measurement and the constant in the equation between the construct and the items measuring the construct (the intercept).

Measurement and Scaling

- **Operational equivalence** concerns how theoretical constructs are operationalized to make measurements, e.g., leisure.

- **Linguistic equivalence** refers to both the spoken and the written language forms used in scales, questionnaires, and interviewing. The scales and other verbal stimuli should be translated so that they are readily understood by respondents in different countries and have equivalent meaning.
Questionnaire Translation: Back Translation

- In **back translation**, the questionnaire is translated from the base language by a bilingual speaker whose native language is the language into which the questionnaire is being translated.
- This version is then retranslated back into the original language by a bilingual whose native language is the initial or base language.
- Translation errors can then be identified.
- Several repeat translations and back translations may be necessary to develop equivalent questionnaires, and this process can be cumbersome and time consuming.

Questionnaire Translation: Parallel Translation

- In **parallel translation**, a committee of translators, each of whom is fluent in at least two of the languages in which the questionnaire will be administered, discusses alternative versions of the questionnaire and makes modifications until consensus is reached.
- In countries where several languages are spoken, the questionnaire should be translated into the language of each respondent subgroup.
- It is important that any nonverbal stimuli (pictures and advertisements) also be translated using similar procedures.
Ethics in Marketing Research

- For each of the six stages of the marketing research design process, the same four stakeholders (client, researcher, respondent, and public) must act honorably and respect their responsibilities to one another.

- Researchers must adopt the ethical guidelines of not only the domestic country but the host country as well.

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Figure 23.4: Concept Map for Types of Equivalence

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