Chapter Nine

Measurement and Scaling: Fundamentals and Comparative Scaling
Focus of This Chapter

• Basic Types of Scales
• Noncomparative Scaling Techniques

Relationship to Previous Chapter

• Research Design Components (Chapter 3)

Relationship to Marketing Research Process

1. Problem Definition
2. Approach to Problem
3. Research Design
4. Field Work
5. Data Preparation and Analysis
6. Report Preparation and Presentation

Copyright © 2011 Pearson Education, Inc.  Chapter 9 - 2
Figure 9.2  Fundamentals and Comparative Scaling:  An Overview
Measurement and Scaling

Scale Characteristics and Levels of Measurement (Fig 9.3)

Primary Scales of Measurement (Fig 9.4 & Fig 9.5) (Table 9.1 & Table 9.2)

Nominal    Ordinal    Interval    Ratio

A Classification of Scaling Techniques (Fig 9.6)

Comparative Scaling Techniques (Fig 9.7, 9.8 & 9.9)

Paired Comparison    Rank Order    Constant Sum

Relationship of Measurement and Scaling to the Marketing Research Process (Fig 9.10)

Application to Contemporary Issues (Fig 9.11)

International    Social Media    Ethics

Opening Vignette

Be a DM! Be an MR! Experiential Learning

What Would You Do?

Copyright © 2011 Pearson Education, Inc.   Chapter 9 - 4
Measurement and Scaling

**Measurement** means assigning numbers or other symbols to characteristics of objects according to certain pre-specified rules.

- One-to-one correspondence between the numbers and the characteristics being measured.
- The rules for assigning numbers should be standardized and applied uniformly.
- Rules must not change over objects or time.
Measurement and Scaling (Cont.)

**Scaling** involves creating a continuum upon which measured objects are located.

Consider an attitude scale from 1 to 100. Each respondent assigned a number from 1 to 100, with 1 = Extremely Unfavorable, and 100 = Extremely Favorable. Measurement is the actual assignment of a number from 1 to 100 to each respondent. Scaling is the process of placing the respondents on a continuum with respect to their attitude toward department stores.
Scale Characteristics

Description
By description we mean the unique labels or descriptors that are used to designate each value of the scale. All scales possess description.

Order
By order we mean the relative sizes or positions of the descriptors. Order is denoted by descriptors such as greater than, less than, and equal to.
Scale Characteristics (Cont.)

Distance
The characteristic of distance means that absolute differences between the scale descriptors are known and may be expressed in units.

Origin
The origin characteristic means that the scale has a unique or fixed beginning or true zero point.
Figure 9.3
An Illustration of Scale Characteristics

Age in Years

120 → Very Old ← Description

Golden Years

Seniors

Middle Aged

Young Adults

Youth

Order

Distance

Origin → 0

New Born

Copyright © 2011 Pearson Education, Inc.  Chapter 9 - 9
Figure 9.4 Primary Scales of Measurement

Primary Scales

Nominal Scale

Ordinal Scale

Interval Scale

Ratio Scale

Highest level of measurement

Lowest level of measurement
Primary Scales of Measurement: Nominal Scale

- The numbers serve only as labels or tags for identifying and classifying objects.
- When used for identification, there is a strict one-to-one correspondence between the numbers and the objects.
- The numbers do not reflect the amount of the characteristic possessed by the objects.
- The only permissible operation on the numbers in a nominal scale is counting.
- Only a limited number of statistics, all of which are based on frequency counts, are permissible, e.g., percentages, and mode.
Primary Scales of Measurement: Ordinal Scale

- A ranking scale in which numbers are assigned to objects to indicate the relative extent to which the objects possess some characteristic.
- Can determine whether an object has more or less of a characteristic than some other object, but not how much more or less.
- Any series of numbers can be assigned that preserves the ordered relationships between the objects.
- In addition to the counting operation allowable for nominal scale data, ordinal scales permit the use of statistics based on centiles, e.g., percentile, quartile, median.
Primary Scales of Measurement: Interval Scale

- Numerically equal distances on the scale represent equal values in the characteristic being measured.
- It permits comparison of the differences between objects.
- The location of the zero point is not fixed. Both the zero point and the units of measurement are arbitrary.
- Any positive linear transformation of the form $y = a + bx$ will preserve the properties of the scale.
- It is not meaningful to take ratios of scale values.
- Statistical techniques that may be used include all of those that can be applied to nominal and ordinal data, and the arithmetic mean, standard deviation, and other statistics commonly used in marketing research.
Primary Scales of Measurement: Ratio Scale

- Possesses all the properties of the nominal, ordinal, and interval scales.
- It has an absolute zero point.
- It is meaningful to compute ratios of scale values.
- Only proportionate transformations of the form $y = bx$, where $b$ is a positive constant, are allowed.
- All statistical techniques can be applied to ratio data.
### Figure 9.5 Primary Scales Measurement

<table>
<thead>
<tr>
<th>Scale</th>
<th>Nominal Numbers Assigned to Runners</th>
<th>Ordinal Rank Order of Winners</th>
<th>Interval Performance Rating on a 0 – 100 Scale</th>
<th>Ratio Time to Finish, in Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17</td>
<td>Third Place</td>
<td>74</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Second Place</td>
<td>90</td>
<td>14.1</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>First Place</td>
<td>97</td>
<td>13.2</td>
</tr>
</tbody>
</table>

Finish
A Comparison of Scaling Techniques

**Comparative scales** involve the direct comparison of stimulus objects. Comparative scale data must be interpreted in relative terms and have only ordinal or rank order properties.

In **noncomparative scales**, each object is scaled independently of the others in the stimulus set. The resulting data are generally assumed to be interval or ratio scaled.
Comparative Scaling Techniques: Paired Comparison Scaling

- A respondent is presented with two objects and asked to select one according to some criterion.
- The data obtained are ordinal in nature.
- Paired comparison scaling is the most widely used comparative scaling technique.
- With $n$ brands, $\frac{n(n - 1)}{2}$ paired comparisons are required.
- Under the assumption of transitivity, it is possible to convert paired comparison data to a rank order.
### Instructions
We are going to present you with ten pairs of shampoo brands. For each pair, please indicate which one of the two brands of shampoo in the pair you would prefer for personal use.

### Recording Form

<table>
<thead>
<tr>
<th>The number of times preferred</th>
<th>Jhirmack</th>
<th>Finesse</th>
<th>Vidal Sassoon</th>
<th>Head &amp; Shoulders</th>
<th>Pert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jhirmack</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Finesse</td>
<td>1&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vidal Sassoon</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Head &amp; Shoulders</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Pert</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

<sup>A</sup> A 1 in a particular box means that the brand in that column was preferred over the brand in the corresponding row. A 0 means that the row brand was preferred over the column brand.

<sup>B</sup> The number of times a brand was preferred is obtained by summing the 1s in each column.
Comparative Scaling Techniques: Rank Order Scaling

- Respondents are presented with several objects simultaneously and asked to order or rank them according to some criterion.

- Possible that the respondent may dislike the brand ranked 1 in an absolute sense.

- Furthermore, rank order scaling also results in ordinal data.

- Only \((n - 1)\) scaling decisions need be made in rank order scaling.
Instructions
Rank the various brands of toothpaste in order of preference. Begin by picking out the one brand that you like most and assign it a number 1. Then find the second most preferred brand and assign it a number 2. Continue this procedure until you have ranked all the brands of toothpaste in order of preference. The least preferred brand should be assigned a rank of 10. No two brands should receive the same rank number. The criteria of preference is entirely up to you. There is no right or wrong answer—just try to be consistent.

<table>
<thead>
<tr>
<th>Brand</th>
<th>Rank Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Crest</td>
<td></td>
</tr>
<tr>
<td>2. Colgate</td>
<td></td>
</tr>
<tr>
<td>3. Aim</td>
<td></td>
</tr>
<tr>
<td>4. Mentadent</td>
<td></td>
</tr>
<tr>
<td>5. Macleans</td>
<td></td>
</tr>
<tr>
<td>6. Ultra Brite</td>
<td></td>
</tr>
<tr>
<td>7. Close Up</td>
<td></td>
</tr>
<tr>
<td>8. Pepsodent</td>
<td></td>
</tr>
<tr>
<td>9. Plus White</td>
<td></td>
</tr>
<tr>
<td>10. Stripe</td>
<td></td>
</tr>
</tbody>
</table>
Comparative Scaling Techniques: Constant Sum Scaling

- Respondents allocate a constant sum of units, such as 100 points, to attributes of a product to reflect their importance.

- If an attribute is unimportant, the respondent assigns it zero points.

- If an attribute is twice as important as some other attribute, it receives twice as many points.

- The sum of all the points is 100. Hence, the name of the scale.
Figure 9.9 Constant Sum Scaling

Instructions
Below are eight attributes of bathing soaps. Please allocate 100 points among the attributes so that your allocation reflects the relative importance you attach to each attribute. The more points an attribute receives, the more important the attribute is. If an attribute is not at all important, assign it zero points. If an attribute is twice as important as some other attribute, it should receive twice as many points.

Form

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Segment I</th>
<th>Segment II</th>
<th>Segment III</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mildness</td>
<td>8</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2. Lather</td>
<td>2</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>3. Shrinkage</td>
<td>3</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>4. Price</td>
<td>53</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>5. Fragrance</td>
<td>9</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>6. Packaging</td>
<td>7</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>7. Moisturising</td>
<td>5</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>8. Cleaning Power</td>
<td>13</td>
<td>60</td>
<td>15</td>
</tr>
</tbody>
</table>

SUM | 100    | 100       | 100         |
Figure 9.10  Relationship of Measurement and Scaling to the Marketing Research Process

**Step 1:** Marketing Research Problem Definition

**Step 2:** Approach to the Problem
  • Specify the information needed

**Step 3:** Research Design
  • Use appropriate level of measurement and appropriate scales to measure each item of information
  • Questionnaire Design: Translate the information needed to appropriate questions using the identified scales

**Step 4:** Fieldwork
  Administer questions using the identified scales

**Step 5:** Data Preparation and Analysis:
  • Use appropriate statistical techniques compatible with the level of measurement of the data

**Step 6:** Report Preparation and Presentation
  Discuss the statistical results and findings in light of the scales used

Copyright © 2011 Pearson Education, Inc.  Chapter 9 - 24
Table 9.1 Primary Scales of Measurement

<table>
<thead>
<tr>
<th>Primary Scale</th>
<th>Basic Description</th>
<th>Scale Characteristics</th>
<th>Common Examples</th>
<th>Marketing Examples</th>
<th>Permissible Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal</td>
<td>Numbers Identify and classify objects</td>
<td>Description</td>
<td>Social Security numbers; numbering of football players</td>
<td>Brand numbers; store types; sex classification</td>
<td>Percentages; mode</td>
</tr>
<tr>
<td>Ordinal</td>
<td>Numbers indicate the relative positions of the objects but not the magnitude of differences between them</td>
<td>Description Order</td>
<td>Quality rankings; rankings of teams in a tournament</td>
<td>Preference rankings; market position; social class</td>
<td>Percentile; median</td>
</tr>
</tbody>
</table>

(continued on next slide)
<table>
<thead>
<tr>
<th>Primary Scale</th>
<th>Basic Description</th>
<th>Scale Characteristics</th>
<th>Common Examples</th>
<th>Marketing Examples</th>
<th>Permissible Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interval</strong></td>
<td>Differences between objects can be compared; zero point is arbitrary</td>
<td>Description Order Distance</td>
<td>Temperature (Fahrenheit, Celsius)</td>
<td>Attitudes; opinions; index numbers</td>
<td>Range; mean; standard deviation</td>
</tr>
<tr>
<td><strong>Ratio</strong></td>
<td>Zero point is fixed; ratios of scale values can be computed</td>
<td>Description Order Distance Origin</td>
<td>Length; weight</td>
<td>Age; income; costs; sales; market shares</td>
<td>Geometric mean (All)</td>
</tr>
</tbody>
</table>
### Table 9.2
Illustration of Primary Scales of Measurement

<table>
<thead>
<tr>
<th>No.</th>
<th>NOMINAL SCALE</th>
<th>ORDINAL SCALE</th>
<th>INTERVAL SCALE</th>
<th>RATIO SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jean Brand</td>
<td>Preference Ranking</td>
<td>Preference Ratings</td>
<td>Price ($)</td>
</tr>
<tr>
<td>1.</td>
<td>Bugle Boy</td>
<td>7</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>2.</td>
<td>Calvin Klein</td>
<td>2</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>3.</td>
<td>Diesel</td>
<td>8</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>4.</td>
<td>Gap</td>
<td>3</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>5.</td>
<td>Guess?</td>
<td>1</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>6.</td>
<td>Jordache</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>7.</td>
<td>Lee</td>
<td>9</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>8.</td>
<td>Levi</td>
<td>6</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>9.</td>
<td>Old Navy</td>
<td>4</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>10.</td>
<td>Wrangler</td>
<td>10</td>
<td>2</td>
<td>12</td>
</tr>
</tbody>
</table>
Relative Advantages of Comparative Scales

- Small differences between stimulus objects can be detected.
- Same known reference points for all respondents.
- Easily understood and can be applied.
- Involve fewer theoretical assumptions.
- Tend to reduce halo or carryover effects from one judgment to another.
Relative Disadvantages of Comparative Scales

- Ordinal nature of the data.
- Inability to generalize beyond the stimulus objects scaled.
International Marketing Research

- In developing countries, the respondents might have difficulty using interval and ratio scales. Consumer preferences in these countries are best measured with ordinal scales.
- The primary scales should be matched to the profile of the target respondents.
Marketing Research & Social Media

- All the primary scales and all the comparative scales can be easily implemented in social media.
- An analysis of social media content can shed light on the level of measurement that is appropriate in a given project and provide guidance on the type of scaling techniques to use.
- Specific measures have been developed to evaluate social media sites based on information that is publicly available, e.g., longevity, output (frequency, quantity), inbound links, technorati, bloglines or blogpulse rankings, number of friends or followers, number of comments, and media citations.
Ethics in Marketing Research

- Knowingly using inappropriate scales raises ethical questions.
- It is the obligation of the researcher to obtain the data that are most appropriate given the research questions.
Acronym: Four

The four primary types of scales can be described by the acronym FOUR:

F igurative: nominal scale
O rdinal scale
U nconstrained zero point: interval scale
R atio scale
Acronym: Scales

The different comparative and noncomparative scales can be represented by the acronym SCALES:

S emantic differential scale
C onstant sum scale
A rranged in order: rank order scale
L ikert scale
E ngaged: paired comparison scale
S tapel scale