Measurement can be described as a way of obtaining symbols to represent the properties of persons, objects, events or states under study - in which the symbols have the same relevant relationship to each other as do the things represented.

<table>
<thead>
<tr>
<th>Number</th>
<th>Property Under Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
</tr>
</tbody>
</table>

We could have also assigned:

<table>
<thead>
<tr>
<th>M</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Female</td>
</tr>
</tbody>
</table>

But Not:

<table>
<thead>
<tr>
<th>A</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Female</td>
</tr>
</tbody>
</table>

1:1 CORRESPONDENCE BETWEEN THE NUMBER SYSTEM AND PROPERTY UNDER STUDY
Scaling

- The ability to assign numbers to objects in such a way that:
  - Numbers reflect the relationship between the objects with respect to the characteristics involved
  - It allows investigators to make comparison of amount and change in the property being measured

Four (4) primary types of scales - Nominal, Ordinal, Interval and Ratio

Three (3) important characteristic of real number system are used to devise the above scales:

ORDER : numbers are ordered
DISTANCE : differences between numbers are ordered
ORIGIN : series has a unique origin indicated by 0 (zero)

Scale - A Quick Overview

- NOMINAL SCALE
  - Least restrictive of all scales. Does not possess order, distance or origin
  - Numbers assigned serve only as a label or tags for identifying objects, properties or events
  - Example
    East : 1 West : 2
    North : 3 South : 4
  - Permissible mathematical operations: percentage, frequency, mode, contingency coefficients

- ORDINAL SCALE
  - Possess order but not distance or origin
  - Numbers assigned preserve the order relationship (rank) and the ability to distinguish between elements according to a single attribute & element
  - Example
    Bata : 1st Sree Leathers : 2nd
    Khadims : 3rd Titas : 4th
  - Permissible mathematical operations: (+) median, percentile, rank correlation, sign test and run test
**Scale - A Quick Overview**

**INTERVAL SCALE**
- Possess the characteristic of order and distance
- DOES NOT possess origin
- Numbers are assigned in such a way that they preserve both the order and distance but do not have a unique starting point
- Example: temperature scale -
  - 50°F is twice as warm as 25°F
  - 10°C is not twice as warm as -3.9°C
- Permissible mathematical operations
- (+) Mean, average deviation, standard deviation, correlation, t F

**RATIO SCALE**
- Possess the characteristic of order distance and origin
- Numbers are assigned in such a way that they preserve both the order distance and origin
- Example: length (KM scale), weight (KG scale)
  - 50 KG is twice as heavy as 25 KG
  - 110.24 pound is twice as heavy as 55.12 pound
- Permissible mathematical operations: ALL

**Scaling Techniques - Overview**

[Diagram showing types of scales based on data collection techniques and stimulus variability methods, including paired comparison, ranking method, ordered category sorting, direct judgement, fractionalization, and constant sum.]
1.1 Variability Method Scales

**PAIRED COMPARISON**
- Respondent to choose one of the pair of stimulus that “dominates” the other w.r.t some designated property of interest
- Example:
  Compare 6 detergent brands on “gentleness on the hands”
  \[ \binom{6}{2} = 15 \text{ paired comparison on the comparison grid} \]

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>x</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>x</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>x</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

- Implicitly assumes (a) transitivity will be maintained (b) respondent has experience of all the brands on the same attribute

**RANKING METHOD**
- Requires respondent to order stimulus w.r.t. Some designated property of study
- Example:
  Rank 6 detergent brands on “gentleness on the hands”
  \[ \Rightarrow \text{Normally the respondent is asked to order K/N i.e. Rank top 3 brands (=K) out of the 6 brands (=N)} \]
- Implicitly assumes (a) respondent has experience on all the brands on the same attribute (b) respondents ranking will correctly reflect his preference

**ORDER CATEGORY SORTING**
- Requires respondent to assign stimulus to ordered categories
- Example:
  Assign 6 detergent brands into following categories - (a) Very Gentle (b) Moderately Gentle (c) Harsh
- Useful when a large number of stimuli or brands are to be rated
1.2 Rating Method Scales

**RATING SCALES**

- One of the most popular & easily applied data collection technique
- The respondent is required to place the product / attribute under study on a ordered set of categories and thereby assign a “degree of possessed characteristic” to the attribute under study
- Rating scales can be (a) numerical (b) graphical (c) verbal (d) a mix of all three
- Example
  
  | Very gentle | [ ] | 10 Definitely will buy |
  | Somewhat gentle | [ ] | 5 May or May Not Buy |
  | Neither gentle nor harsh | [ ] | 0 Definitely will not Buy |
  | Slightly harsh | [ ] |
  | Very harsh | [ ] |

- It assumes (a) items are being capable of being ranked (b) respondent can psychologically break the ranking into equal intervals (c) scale is ordinal in nature

---

1.3 Quantitative Judgement Scales

**DIRECT JUDGEMENT SCALE**

- An advancement on the rating method scale
- Assumes that the respondent is able to give a numerical rating with each stimulus with respect to some designated attribute
- The scales used are assumed to be *interval* or *ratio* scales
- Is normally of two types
  - Limited response category - The respondent is limited to choose between one of the given categories
  - Unlimited response category - The respondent is free to assume the magnitude of scale and divide it as per his convenience
- Example:

<table>
<thead>
<tr>
<th>Very Harsh</th>
<th>Brand A</th>
<th>Very Gentle</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 6 5 4 3 2 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rohit Vishal Kumar
### 1.3 Quantitative Judgement Scales

**FRACTIONALISATION**
- The respondent is asked to give numerical estimates to the attributes under study relative to a previously exposed attribute.
- **Example:**
  Assume that the harshness of brand A is equal to 1.00. Now rate the relative harshness of the following brands with respect to brand A.
  
<table>
<thead>
<tr>
<th>Brand</th>
<th>Relative Harshness</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>1.25</td>
</tr>
<tr>
<td>C</td>
<td>0.60</td>
</tr>
<tr>
<td>D</td>
<td>2.50</td>
</tr>
<tr>
<td>E</td>
<td>0.90</td>
</tr>
</tbody>
</table>

**CONSTANT SUM**
- The respondent is required to distribute a “number of points - usually 100” over a set of alternatives such that the numbers distributed reflect the relative magnitude of importance of alternatives.
- **Example:**
  
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshness</td>
<td>25</td>
</tr>
<tr>
<td>Cleaning Ability</td>
<td>47</td>
</tr>
<tr>
<td>Gentle on hands</td>
<td>12</td>
</tr>
<tr>
<td>Price</td>
<td>16</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
</tr>
</tbody>
</table>

---

**Scaling Techniques - Overview**

Type of Scales

- **Based on Data Collection Techniques**
  - Summated Scale
  - Q-Sort Technique
  - Differential Scale

- **Subject Centric Approach**
  - Thurston Case V

- **Stimulus Centric Approach**
  - Semantic Differential
  - Stapel Scale

- **Response Centric Approach**
  - Scalogram Analysis
  - MA Modeling
Development of Stimulus Scales

Follow rigorous development procedure

- Create
  - Set up the various stimulus which will act as the parts of the scale
- Test
  - Test the scale to see how the responses are distributed on each stimulus
- Normalize
  - Normalize or Standardize the response categories. Re-Test if necessary
- Validate
  - Check using Factor or Cluster Analysis whether the scales are predicting correctly
- Use
  - Use it in the actual survey

2.1 Subject Centric Scales

SUMMATED SCALE (LIKERT SCALE)

Respondent are required to respond to each of the statement in terms of several degrees of agreement / disagreement

Each response is given a weight - (not disclosed to the respondent)

Similar to direct judgement method in look and feel and is useful in judging the degree of agreement / disagreement

Example: To identify the outgoing type of personality

Please rate yourself on the following statements

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>NAND</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I like playing cricket</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2. I like going to parties</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3. I love reading novels</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4. Enjoy life is my motto</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5. I enjoy working alone</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Item 1, 2, 4 are favorable and carry (+2 +1 0 -1 -2) as weights

Item 3 & 5 are unfavorable and carry (-2 -1 0 +1 +2) as weights

Response set (A, SA, D, SA, SD) gets (+1 +2 +1 +2 +2) = +8 [outgoing]

Response set (A, N, SA, D SA) gets (+1 +0 -2 -1-2) = -4 [not outgoing]
2.1 Subject Centric Scales

**Q SORT TECHNIQUE (STEPHENSON SCALE)**
- Respondent are required to sort a set number of statements in predetermined categories (usually 3 / 5 / 7 / 11) - with the restriction that at least ‘k’ statement should be placed in each category
- Each category is given a weight and then these weight are used to determine the subject’s attitude towards the attitude under study
- Normally used as a precursor to factor / cluster analysis

**DIFFERENTIAL SCALE (THURSTON SCALE)**
- A modification of the Q-Sort Technique
- It assumes that the respondent will agree with a subset of the statements - this agreement in turn revealing the preference of the consumer
- The development of the statements for the purpose of the study is done using blind judges

<table>
<thead>
<tr>
<th>Most Agreed with</th>
<th>Neutral</th>
<th>Least Agreed with</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Two Items)</td>
<td>(Three Items)</td>
<td>(Two Items)</td>
</tr>
<tr>
<td>(+1)</td>
<td>(0)</td>
<td>(-1)</td>
</tr>
</tbody>
</table>

2.2 Stimulus Centric Scales

**THURSTON CASE - V SCALING MODEL**
- A scaling model that allows construction of a uni-dimensional interval scale from various data collection techniques
- Fairly complex technique - seldom used
- Based on interval scaled data
- It assumes that “reaction to a stimulus” is normally distributed with mean (\(\lambda\)) and variance (\(\rho^2\)). As such we can construct:

\[
R_J - R_K = Z_{jk} [S_J^2 + S_K^2 - 2 p_{jk} S_J S_K]^{0.5}
\]

where
- \(R_J, R_K\) = is the response on stimulus J, K
- \(S_J, S_K\) = standard deviation of response J, K
- \(p_{jk}\) = the correlation coefficient between J and K
- \(Z_{jk}\) = The normal variate corresponding to J, K

- The advantage of using “Thurston Case V” is that it leads to fairly accurate predictions
2.2 Stimulus Centric Scales

**SEMANTIC DIFFERENTIAL SCALE**

- **SEMANTIC**: relating to the study of meaning and the change in meaning.
- This scale uses “SEMANTIC” to understand the respondent’s “interpretation of meaning”.
- It allows the researcher to probe both the direction and intensity of respondents attitudes using interval scaled data.
- Mainly used in image mapping studies.
- **Example**: understanding the corporate image of BATA

```
Powerful: X | ___ | ___ | ___ | ___ | ___ | ___ Weak
Modern: ___ | ___ | ___ | ___ | X | ___ | ___ Old fashioned
Warm: ___ | ___ | ___ | ___ | ___ | X | ___ Cold
Reliable: ___ | ___ | ___ | ___ | ___ | ___ | X Unreliable
Careful: ___ | ___ | ___ | ___ | ___ | ___ | ___ Careless
```

- Semantic differential requires extensive pre-testing before it can be put into actual research. Indiscriminate usage may not generate the correct image response leading to failure of the project.

---

**STAPEL SCALE**

- A modification of the semantic differential scale.
- An even numbered non-verbal rating scale used in conjunction with a single adjective.
- Measure both intensity and direction of response.
- **Example**: how would you rate BATA Stores on “cleanliness”

```
cleanliness
-3 -2 -1 +1 +2 +3
```

---

**MULTIATTRIBUTE MODELLING**

- Proposed by Martin Fishbein in 1967.
- Uses mathematical model (usually linear model) to interpret a person’s attitude on a particular aspect.

\[
A_O = \Sigma B_i \alpha_i
\]

Where:
- \( A_O \) is the respondent’s overall attitude towards some object.
- \( B_i \) is the respondents strength of belief on an attribute.
- \( \alpha_i \) is the weight associated with the strength of belief.

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2.3 Response Centric Scales

**CUMULATIVE SCALES**
- Consist of a set of items on which the respondent indicates agreement/disagreement
- Based on the pattern of response - respondent preferences are ascertained

**SCALOGRAM ANALYSIS**
- Developed by Louis Guttman in 1958
- Builds on the cumulative scale and tries to develop a pattern of “pre-determined responses” by scaling both respondent and responses

**MULTIDIMENSIONAL SCALING**
- An advancement over Cumulative and Scalogram Analysis.
- Tries to determine consumer preferences on more than one dimension simultaneously
- Extremely difficult to develop administer and interpret

---

**Limitations of Scaling Procedure**

- Most scales measure attitudes along a single dimension
  - Human beings are more complex and are normally exposed to more than one stimuli - product features, price, package design, advertising, brand name etc
- Scales fail to measure the extraneous influences
  - Purchase decisions may be made because of pressure from boss etc. Under such issues - and especially in areas on high involvement goods - scales and measurement may fail completely
- It is difficult to develop “useable measures” from scales
  - For example, question on “intention to buy” may not be indicative of market share in the next 6 months
  - There still exist a divergence between “what scales can capture” and “what market research can deliver”
QUESTIONS…
COMMENTS…
FEEDBACK…

…Feel Free to Ask Me…

THANK YOU

“The doors of wisdom are never shut”
Benjamin Franklin