Measurement & 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.

Scaling is the assignment of objects to numbers or semantics according to a rule. In scaling, the objects are text statements, usually statements of attitude, opinion or feeling.

Scale Characteristics

- **Description:** Unique labels that are used to designate each value of the scale. All scales possess description.

- **Order:** The relative sizes or positions of the descriptors. Order is denoted by descriptors such as "greater than", "less than", and "equal to".

- **Distance:** The characteristics 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 unique or fixed beginning.

Levels of Measurement Scales

The level of measurement refers to the relationship among the values that are assigned to the attributes, feelings or opinions for a variable. Typically, there are four levels of measurement scales or methods of assigning numbers:

a) **Nominal Scale:** Nominal Scale is the crudest among all measurement scales but it is also the simplest scale. In this scale the different scores on a measurement simply indicate different categories. The nominal scale does not express any values or relationships between variables.

The nominal scale is often referred to as a categorical scale. The assigned numbers have no arithmetic properties and act only as labels. The only statistical operation that can be performed on nominal scales is a frequency count. We cannot determine an average except mode.

For example: labeling men as '1' and women as '2' which is the most common way of labeling gender for data recording purpose does not mean women are 'twice something or other' than men. Nor it suggests that men are somehow 'better' than women.

b) **Ordinal Scale:** involves the ranking of items along the continuum of the characteristic being scaled. In this scale, the items are classified according to whether they have more or less of a characteristic.

The main characteristic of the ordinal scale is that the categories have a logical or ordered relationship. This type of scale permits the measurement of degrees of difference, (i.e. 'more' or 'less') but not the specific amount of differences (i.e. how much 'more' or 'less'). This scale is very common in marketing, satisfaction and attitudinal research. Using ordinal scale data, we can perform statistical analysis like Median and Mode, but not the Mean.

For example, a fast food home delivery shop may wish to ask its customers: How would you rate the service of our staff?

(1) Excellent (2) Very Good (3) Good (4) Poor (5) Worst

c) **Interval Scale:** Interval Scale is a scale in which the numbers are used to rank attributes such that numerically equal distances on the scale represent equal distance in the characteristic being measured. An interval scale contains all the information of an ordinal scale, but it also one allows to compare the difference/distance between attributes. Interval scales may be either in numeric or semantic formats.

The interval scales allow the calculation of averages like Mean, Median and Mode and dispersion like Range and Standard Deviation.

For example, the difference between '1' and '2' is equal to the difference between '3' and '4'. Further, the difference between '2' and '4' is twice the difference between '1' and '2'.

Measuring temperature is an example of interval scale. But, we cannot say 40°C is twice as hot as 20°C.

d) **Ratio Scale:** Ratio Scale is the highest level of measurement scales. This has the properties of an interval scale together with a fixed (absolute) zero point. The absolute zero point allows us to construct a meaningful ratio.

Ratio scales permit the researcher to compare both differences in scores and relative magnitude of scores. Examples of ratio scales include weights, lengths and times.

For example, the number of customers of a bank's ATM in the last three months is a ratio scale. This is because you can compare this with previous three months.

For example, the difference between 10 and 15 minutes is the same as the difference between 25 and 30 minutes and 30 minutes is twice as long as 15 minutes

Scaling Techniques
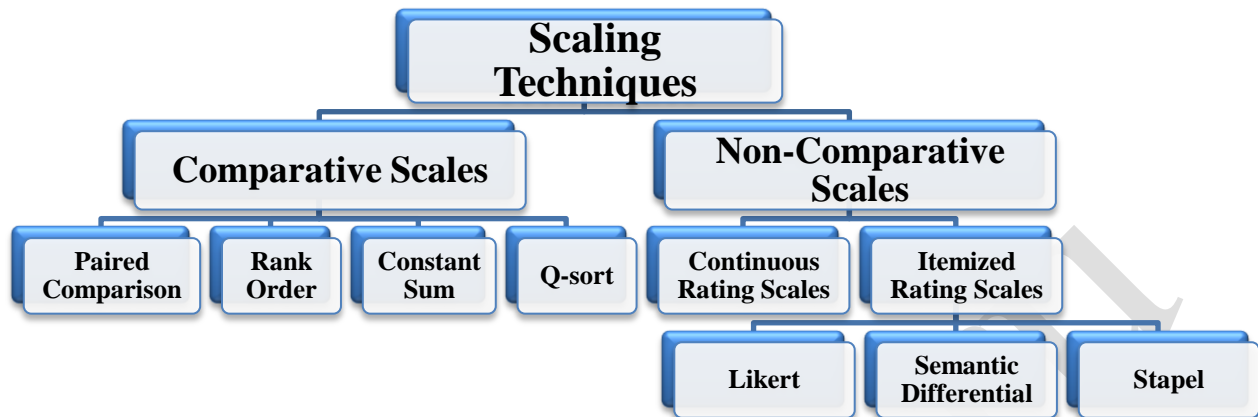
1. Comparative Scales

In comparative scaling, the respondent is asked to compare one subject with another. The comparative scale can further be divided into the following four types of scaling techniques:

a. **Paired Comparison:** A comparative scaling is a technique in which a respondent is presented with two objects at a time and asked to select one object in the pair according to some criteria. The data obtained are ordinal in nature.

   For Example, there are four types of cold drinks – Coke, Pepsi, Sprite, and Limca. The respondent can prefer Pepsi to Coke or Coke to Sprite, etc.

b. **Rank Order:** This is another type of comparative scaling technique in which respondents are presented with several items simultaneously and asked to rank them in the order of priority. This is an ordinal scale that describes the favored and unfavored objects, but does not reveal the distance between the objects. This yields better results when direct comparison is required between the given objects.

   For Example, if we are interested in ranking the preference of some selected brands of cold drinks, we may use the following format for recording the responses:

Brand	Rank
Coke	3
Pepsi	2
Sprite	1
Limca	4

c. **Constant Sum:** In this scale, the respondents are asked to allocate a constant sum of units such as points, rupees, or chips among a set of stimulus objects with respect to some criterion.

For example, you may wish to determine how important the attributes of price, fragrance, packaging, cleaning power, and lather of a detergent are to consumers. Respondents might be asked to divide a constant sum to indicate the relative importance of the attributes.

Attribute	Number of Points
Price	50
Fragrance	05
Packaging	10
Cleaning Power	30
Lather	05
Total Points	**100**

d. **Q-sort:** This is a comparative scale that uses a rank order procedure to sort objects based on similarity with respect to some criterion. The important characteristic of this methodology is that it is more important to make comparisons among different responses of a respondent than the responses between different respondents. Therefore, it is a comparative method of scaling rather than an absolute rating scale. In this method the respondent is given statements in a large number for describing the characteristics of a product or a large number of brands of a product.

2. **Non-Comparative Scales**

In non-comparative scaling respondents need only evaluate a single object. Their evaluation is independent of the other object which the researcher is studying. The non-comparative scaling techniques can be further divided into:

a. **Continuous Rating Scales:** It is very simple and highly useful. In continuous rating scale, the respondent's rate the objects by placing a mark at the appropriate position on a continuous line that runs from one extreme of the criterion variable to the other. Example: Question: How would you rate the TV advertisement as a guide for buying?

b. **Itemized Rating Scales:** Itemized rating scale is a scale having numbers or brief descriptions associated with each category. The categories are ordered in terms of scale position and the respondents are required to select one of the limited numbers of categories that best describes the product, brand, company, or product attribute being rated. Itemized rating scales are widely used in marketing research.

The itemized rating scales can be in the form of: (i) graphic, (ii) verbal, or (iii) numeric as shown below:

Itemised Graphic Scale	Itemised Verbal Scale	Itemised Numeric Scale
Favourable (smiling face)	Completely satisfied	-5
		-4
	Somewhat satisfied	-3
		-2
Indifferent (neutral face)	Neither satisfied nor dissatisifed	-1
		0
	Somewhat dissatisfied	$+1$
		$+2$
Unfavourable (frowning face)		$+3$
	Completely dissatisfied	$+4$
		$+5$

i.   **Likert:** Likert, is extremely popular for measuring attitudes, because, the method is simple to administer. With the Likert scale, the respondents indicate their own attitudes by checking how strongly they agree or disagree with carefully worded statements that range from very positive to very negative towards the attitudinal object. Respondents generally choose from five alternatives (say strongly agree, agree, neither agree nor disagree, disagree, strongly disagree).

ii. **Semantic Differential:** This is a seven point rating scale with end points associated with bipolar labels (such as good and bad, complex and simple) that have semantic meaning. It can be used to find whether a respondent has a positive or negative attitude towards an object. It has been widely used in comparing brands, products and company images. It has also been used to develop advertising and promotion strategies and in a new product development study.

iii. **Stapel:** The Stapel scale was originally developed to measure the direction and intensity of an attitude simultaneously. Modern versions of the Stapel scale place a single adjective as a substitute for the Semantic differential when it is difficult to create pairs of bipolar adjectives. The modified Stapel scale places a single adjective in the centre of an even number of numerical Values.