Uni & Multi Dimensional Scales

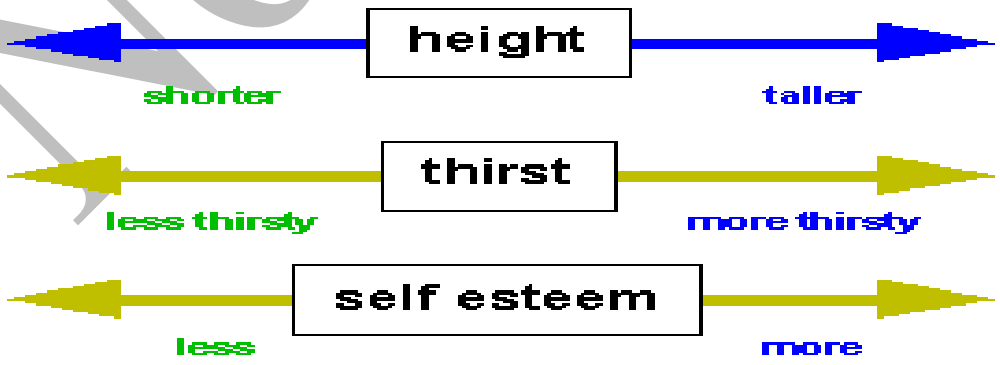
What is Scaling/ why we do scaling??

Scaling is the branch of measurement that involves the construction of an instrument that associates qualitative constructs with quantitative metric units. Scaling evolved out of efforts in psychology and education to measure "immeasurable" constructs like authoritarianism and self esteem.

The most common reason for doing scaling is for scoring purposes. When a participant gives their responses to a set of items, we often would like to assign a single number that represents that's person's overall attitude or belief. For eg: we would like to be able to give a single number that describes a person's attitudes towards immigration

Dimensionality

A scale can have any number of dimensions in it. Most scales that we develop have only a few dimensions. What's a dimension? Think of a dimension as a number line. If we want to measure a construct, we have to decide whether the construct can be measured well with one number line or whether it may need more. For instance, height is a concept that is unidimensional or one-dimensional. We can measure the concept of height very well with only a single number line (e.g., a ruler).



Uni -dimensional or Multidimensional?

Scales are generally divided into two broad categories: uni dimensional and multidimensional. The uni dimensional scaling methods were developed in the first half of the twentieth century and are generally named after their inventor.

Meaning of Uni Dimensional Scaling: A unidimensional measurement scale has only one ("uni") dimension. In other words, it can be represented by a single number line. Some examples of simple, unidimensional scales: Height of people, Weight of cars, IQ, and Volume of liquid.

Advantages of using a uni dimensional model

- Uni dimensional concepts are generally easier to understand. You have either more or less of it, and that's all. You're taller or shorter, heavier or lighter.
- It's also important to understand what a uni dimensional scale is as a foundation for comprehending the more complex multidimensional concepts.
- But the best reason to use uni dimensional scaling is because you believe the concept you are measuring really is uni dimensional in reality. As you've seen, many familiar concepts (height, weight, temperature) are actually uni dimensional.
- But, if the concept you are studying is in fact multidimensional in nature, a uni dimensional scale or number line won't describe it well.
- If you try to measure academic achievement on a single dimension, you would place every person on a single line ranging from low to high achievers. But how do you score someone who is a high math achiever and terrible verbally, or vice versa? A uni dimensional scale can't capture that type of achievement.

The Major Uni dimensional Scale Types

There are three major types of uni dimensional scaling methods. They are similar in that they each measure the concept of interest on a number line. But they differ considerably in how they

arrive at scale values for different items. The three methods are Thurstone or Equal-Appearing Interval Scaling, Likert or "Summative" Scaling, and Guttman or "Cumulative" Scaling.

The three major types of unidimensional scales are:

a) Thurston or “Equal-Appearing Interval” Scale: has a number of agree/disagree statements with numerical values attached. It is designed to be similar to an interval scale

b) Likert or “Summative” Scale: respondents are asked to rate items according to a level of agreement.

c) Guttman or “Cumulative” Scale: a scale with binary YES/NO answers.

Multi-Dimensional Scaling

Multi-dimensional scaling (MDS) is a statistical technique that allows researchers to find and explore underlying themes, or dimensions, in order to explain similarities or dissimilarities (i.e. distances) between investigated datasets.

One can analyse any kind of similarity or dissimilarity matrix using multi-dimensional scaling. Plotting these data sets on a multi-dimensional scale allows for easier interpretation and comparison by researchers than a linear dataset permits.

E.g.: A possible example of when multi-dimensional scaling (MDS) might be used is if we have six utility companies and we want to understand how they are considered differently by respondents. We would invite consumers to complete a survey in which each of the six companies would be paired with each of the others, and the respondents would be asked in a series of scale based questions how similar they believe them to be, for a number of attributes. Examples of attributes may be: quality, service and price.

Attributes of Multi Dimensional Scaling

a) It consists of a group of analytical techniques which are used to study consumer attitudes related to perceptions and preferences. It is used to study-

- ❖ The major attributes of a given class of products perceived by the consumers in considering the product and by which they compare the different ranks.
- ❖ To study which brand competes most directly with each other.
- ❖ To find out whether the consumers would like a new brand with a combination of characteristics not found in the market.
- ❖ What would be the consumer's ideal combination of product attributes.
- ❖ What sales and advertising messages are compatible with consumers brand perceptions.

b) It is a computer based technique.

c) The respondents are asked to place the various brands into different groups like similar, very similar, not similar, and so on.

d) A goodness of fit is traded off on a large number of attributes. Then a lack of fit index is calculated by computer program. The purpose is to find a reasonably small number of dimensions which will eliminate most of the stress. After the configuration for the consumer's preference has been developed, the next step is to determine the preference with regards to the product under study.

e) These techniques attempt to identify the product attributes that are important to consumers and to measure their relative importance.

f) This scaling involves a unrealistic assumption that a consumer who compares different brands would perceive the differences on the basis of only one attribute. For example, what are the attributes for joining M.Com course. The responses may be -to do PG, to go into teaching line to get knowledge, appearing in the NET.

g) There are a number of attributes; you cannot base decision on one attribute only. Therefore, when the consumers are choosing between brands, they base their decision on various attributes.

h) In practice, the perceptions of the consumers involve different attributes and any one consumer perceives each brand as a composite of a number of different attributes. This is a shortcoming of this scale.

i) Whenever we choose from a number of alternatives, go for multi- dimensional scaling. There are many possible uses of such scaling like in market segmentation, product life cycle, vendor evaluations and advertising media selection.

j) The limitation of this scale is that it is difficult to clearly define the concept of similarities and preferences. Further the distances between the items are seen as different