Measurement and Scales & Types of Data

Nature of Measurement

- To measure is to discover the extent, dimensions, quantity or capacity of something , especially by comparison with a standard.

- Measurement is a process that consists of assigning numbers to empirical events (observations) in compliance with a set of rules.
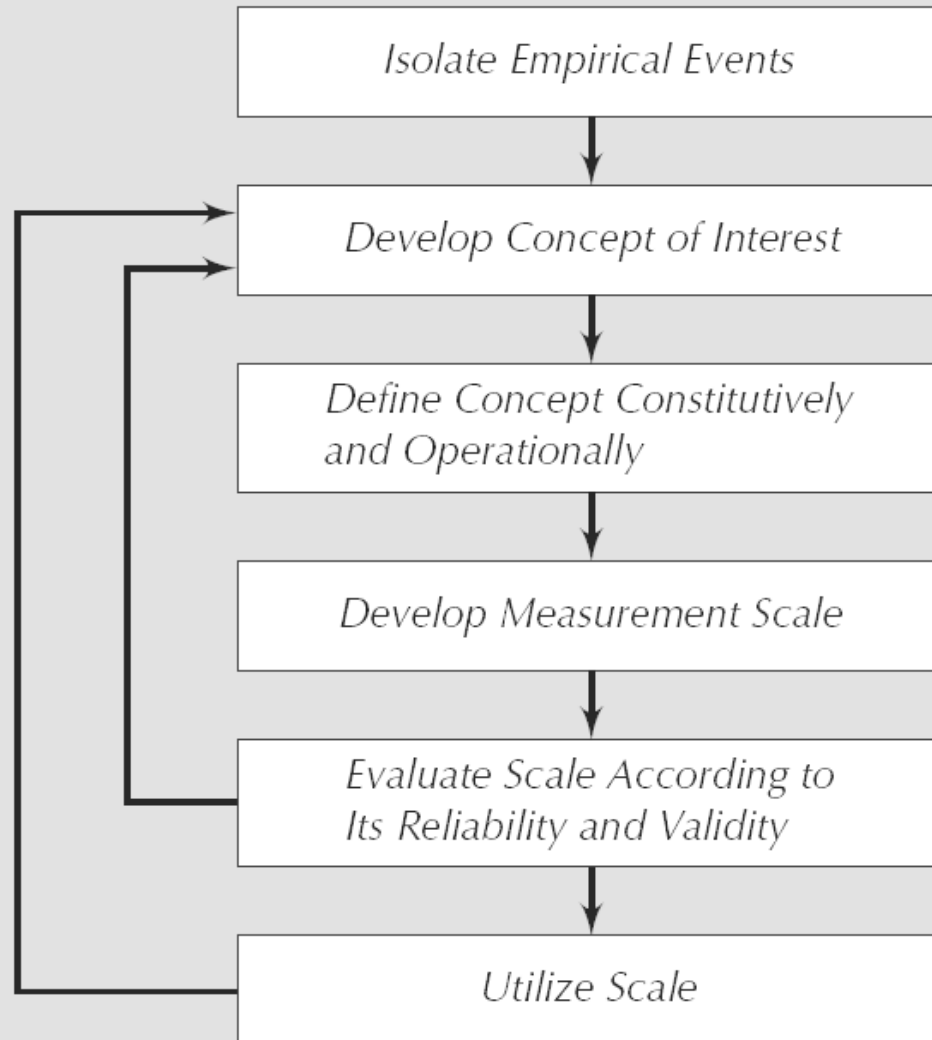
Process- Steps in Measurement

1. Selecting the observable empirical events. e.g., gender, preference of auto styling.

2. Developing a set of mapping rules.

   e.g., M for male, F for female; 1- very undesirable,…….5 - very desirable

3. Applying mapping rule to each observation (sample) of that event.

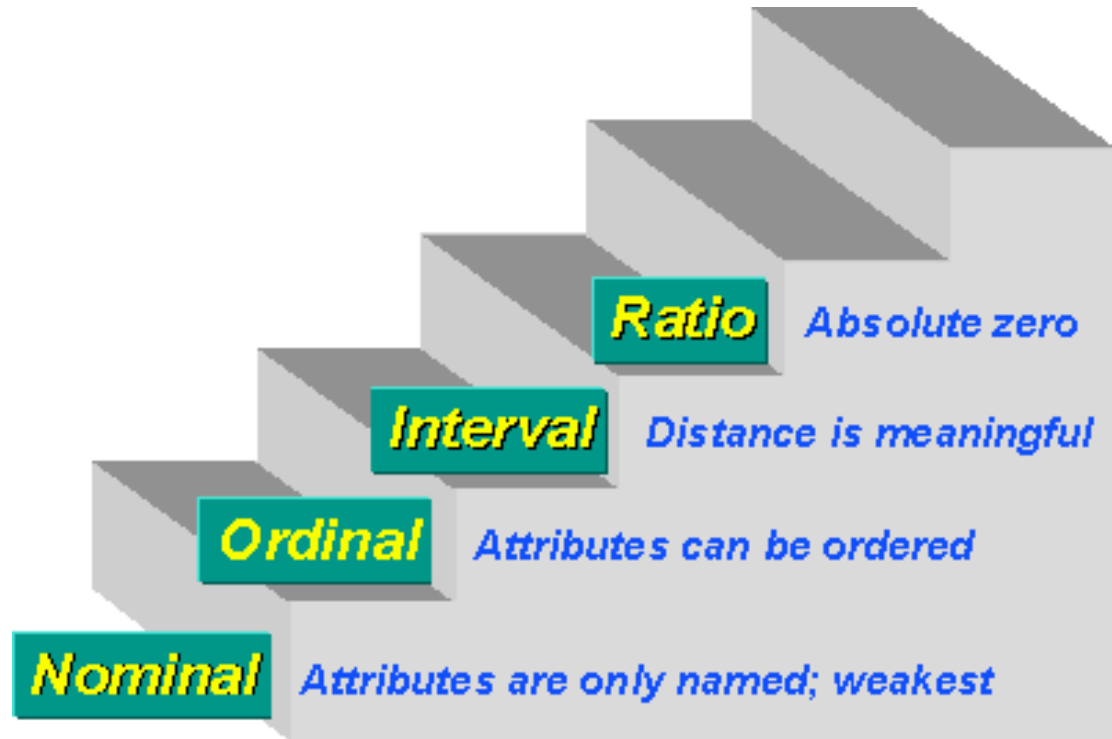# Example of the Relationships Among the Three Components of Measurement

Measuring Sex of Administrator			Measuring Job Satisfaction of Subordinates		
Empirical Event	*Mapping Rule*	*Number*	*Number*	*Mapping Rule*	*Empirical Event*
Administrator's sex	Assign 1 if male Assign 2 if female	1 or 2	−2, −1, 0, 1, or 2	Assign −2 if very dissatisfied Assign −1 if dissatisfied Assign 0 if neither Assign 1 if satisfied Assign 2 if very satisfied	Subordinate job satisfaction

The Measurement Process

Levels of Measurement

- Nominal
- Ordinal
- Interval
- Ratio

Ratio — Absolute zero

Interval — Distance is meaningful

Ordinal — Attributes can be ordered

Nominal — Attributes are only named; weakest

Nominal Data Scale

The data collected through this scale can be grouped (on a variable) into two or more mutually exclusive categories, and colelctively exhaustive.

-Least powerful of the 4 data types.

- Statistical test used with such data is chi-square test.

- Since the only quantification is th etotal number in each category, only MODE is used; no DISPERSION as a measure of variation.

Nominal Data

For example…GENDER…male/female

where to you live? Urban; rural; semi-urban

- Nominal measures are especially valuable in *exploratory research* where the objective is to uncover relationship , rather than precise measurements.

Ordinal Data Scale

This includes the characteristics of nominal scale + the feature of '***order***'.

- This is possible if the ***Transitivity principle*** is fulfilled.

- This scale just makes ranking possible, but without specifying the distance between the ranks.

- Ranks orders represent ordinal scales and are frequently used in ***qualitative phenomena.***

Ordinal Scale

e.g. Preference in job attributes

Please rank from 1 most important to 5 least important the following attributes:

- Interacting with others
- Using multiple skills
- Completing a task from beginning to end
- Serving others
- Work independently

- **Appropriate measure of central tendency is MEDIAN**

- ***A percentile or quartile measure is used for measuring DISPERSION.***

Interval Data scale

In this, the intervals are adjusted in terms of some rule as a basis for making the units equal.

- This scale has the charateritics of **categorization** + **order** + **equality of intervals.**

- The statistical measure possible with such data are **Arithmetic Mean** and **Standard Deviation.**

- **Tests of significance that can be used are 't' test and 'F' test.**

Interval Scale

-**Interval scales can have arbitrary zero, but not possible to have Absolute zero.**

e.g. Calendar Time.

e.g. Preference in job attributes

Using a scale of 1 (strongly disagree), 2 (disagree), 3 (neither agree nor disagree), 4 (agree) and 5 (strongly agree), please indicate the extent of your agreement by circling the appropriate number.

The following are very important to me					
Interacting with others	1	2	3	4	5
Using multiple skills	1	2	3	4	5
Complete a task from beginning to end	1	2	3	4	5
Serving others	1	2	3	4	5
Working independently	1	2	3	4	5

Ratio Scale

A ratio scale is an interval scale with a natural/Absolute/True Zero of measurement.

- Ratio data represents the actual amounts of a variable. **e.g.** weight, distance, height.

- All types of Statistical analysis can be used with ratio scaled variable.

- Thus, ratio data has features of ….

Categorization+ order+ equal intervals + **absolute origin**

Data Types - Levels of Measurements

Empirical Scale	Basic Operations	Measures of Typical use	Averages
Nominal	Determination of equality	Classification Male-Female Occupations	Mode
Ordinal	Determination of greater or less	Ranking Preference Attitude	Median
Interval	Determination of equality of intervals	Index numbers Temperature	Mean
Ratio	Determination of equality of ratios	Sales Unit produced No. of customers	Mean Geometric

Features of Sound Measurement

1. Validity- 'refers to the extent to which a test measures that it actually wish to measure'

2. Reliability- 'accuracy and precision of the measurement procedure'

3. Practicality- ' concerned with a wide range of factors of economy, convenience and interpretability'.

Features of Sound Measurement

1. Validity- 'refers to the extent to which a test measures that it actually wish to measure'

2. Reliability- 'accuracy and precision of the measurement procedure'

3. Practicality- ' concerned with a wide range of factors of economy, convenience and interpretability'.