



PRINCIPLES OF
MEASUREMENT
SCALE

WHAT IS MEASUREMENT?



Measurement explains the nature of the data collected.



It is a process of recording observation, collected as part of a research.



It is quantifying a characteristic, a quality, a response.....



It is an amount that can be measured. It can be objective (height, weight, age) or subjective (opinion, perception, satisfaction)

WHAT IS MEASUREMENT?



Assign or select an observable empirical event.



Use numbers or symbols to represent the aspects you want to measure in the event.



Apply the mapping rule to connect the observation to the symbol

EXAMPLE 1

- To study whether gender influences the career choice of being a nurse.
- Here, you are interested in learning the male to female ratio. You observe those who visit your nursing college booth at an education fair.
- Record “m” for male and “f” for female.
- Record males as 1 and female as 2

EXAMPLE 2

- To measure the opinion of students on the facilities provided by Universiti Malaysia Sabah.
- This can be done by interviewing a sample of students studying in UMS and also leaving in campus.
- We assign their opinions to a scale ranging from EXCELLENT (5), GOOD (4), NEUTRAL (3), FAIR (2) POOR(1).

WHAT IS MEASURED?



Concept is used in the research to clearly define what is being measured. This help to create a conceptual framework. Conceptual framework is not the same as theoretical framework.



Concept can be classified as:-



Objects deals with concrete things such as people, facilities,



Phenomena deals with things that are not concrete such as attitude, perception, opinion, job satisfaction.....

WHAT IS MEASURED?

- Properties that deals with the characteristics of the objects. It can be divided into
- Physical properties. Weight, height, Age, Posture,
- Psychological properties. Attitude, confidence.....
- Social properties. Friendly, Approachable, leadership, ability.....



RULES OF MEASUREMENT.

- A rule will instruct us what to do or how to assign the values.
- Example: Assign numbers 1 to 5 to the students according to their leadership quality. If the student has high leader quality, you can rate him or her as high as 5. In contrast if the student has poor leadership quality, you can assign him to as low as 1.

RULES OF MEASUREMENT

- Example: Assume a student wants to do a study on stocks. He can define a person as a trader or non-trader. He assigns 1 for those who has experience trading stock and 0 for those who do not have any experience trading stocks.



VARIABLES

- Variables can be divided based on the level of measurement. It can be continuous or discrete in their form.
- Continuous variables has an infinite value. It can be divided or subdivided into smaller values. Example: weight, height....
- Discrete variables has a fixed set of values. The values are distinct like Gender (male or female)

VARIABLES



Continuous and discrete variables have 4 levels of measurement.



Nominal (Categorical without order)



Ordinal (Categorical with order)



Interval (Arranges object according to magnitude and equal interval)



Ratio (Arranges object according to magnitude, equal interval and has true zero point)

CHARACTERISTICS ON
LEVEL OF
MEASUREMENTS:
CONTINUOUS OR
DISCRETE

- Nominal categorizes responses but not necessarily in order. Ordinal scale describes the data in order. Interval scale shows relative order of an observation. It can be between two values. Ratio scales are values given in percentage or a score.
- Nominal and ordinal are discrete but interval and ratio are continuous.



CHARACTERISTICS ON THE LEVEL OF MEASUREMENT: IDENTIFIER/LABEL

- When a respondent is asked about their gender. Option given are “male” or “female”. 1 can be assign for male and 2 can be assign for female.
- It can be used as an identifier/ to label.
- It can be explain using descriptive analysis on the profile of the respondent.

CHARACTERISTICS ON THE LEVEL OF MEASUREMENT: TYPE OF ANALYSIS

- Response like YES or NO can also be nominal. If the dependent variable is measured using YES or NO, a logit regression can be used.
- Nominal scale can also be used when the variable like gender is used as a moderator in a regression.
- Sometimes nominal scale is used as an independent variable in a regression to identify an event in a time series analysis. Example a recession, a change in policy and so on.

CHARACTERISTICS ON THE LEVEL OF MEASUREMENT: MAGNITUDE

- Other than nominal scale, all other scale have magnitudes. It has an inherent order from the least to the highest.
- They are presented in a scale of ascending or descending order
- Example: Position in a race, size of clothes, size of drinks.

CHARACTERISTICS ON THE LEVEL OF MEASUREMENT: EQUAL INTERVAL

- Equal interval means that the scale has a standardized order.
- Difference between each level of scale is the same. Example in a Likert Scale, 5 represents Strongly Agree, 4 is Agree, 3 represents Neutral, 2 is Disagree and 1 is Strongly Disagree. The interval is the same.
- Sometime the interval might not be the same. Example in a race, the 1st position may complete the race is 20 seconds, the 2nd position might be 20.8 seconds and the 3rd is 30 seconds. In this case there is an identifier (position), magnitude (ascending order for the time) and not an equal interval.

CHARACTERISTICS ON THE
LEVEL OF
MEASUREMENT: ABSOLUTE
ZERO

- Absolute zero is a unique feature to a zero scale. There is an existence of a zero (no qualification, no marks or no money)



LEVEL OF MEASUREMENT: NOMINAL SCALE

- It is a measurement usually used for identification purpose.
- It is the coldest and the weakest data.
- It assign numbers to attributes for identification. Example: Variable is gender, Attributes are male and female. Numbers assigned is 1 for male and 2 for female.
- It is not qualitative but it is a label. Statistical Analysis usually used is frequency and percentage. It can be used in regression for logit, moderator and as a dummy variable. Staristical graph used to show nominal scale is bar or pie chart.

LEVEL OF MEASUREMENT: ORDINAL SCALE



It involves ranking or ordering of attributes. It is arranged in an ascending or descending order. Example a survey to measure satisfaction. We use qualifiers like Strongly, Highly, More, less.



Statistical Analysis like median and mode.

LEVEL OF MEASUREMENT: INTERVAL SCALE

- Level are ordered and each numerical distance are equal.
- In an interval scale, you do not only know that A is greater than B but to what extent it is greater.
- Example: Patients temperature, CGPA of students.
- Statistical Analysis: Mean, median, mode, range and standard deviation.

LEVEL OF MEASUREMENT: RATIO SCALE



It is the strongest scale of measurement.



It has an identity, magnitude, equal interval and absolute zero property



Example More than 100kgs, 81 to 100kgs, 61 to 80 kgs, 40 to 60 kgs and less than 40 kgs.

OTHER MEASUREMENT SCALES

- Comparison scale. A comparison between one object than the other. It is used in marketing. It can be divided as paired comparison scale. 2 objects are given. Choose one given in a predefine criterion.
- Rank Order Scale. Predefine criterion are set. You are given multiple option. Rank them. Example, Rank the following brands from the least preferred to the most preferred. Co.Co, Pepsi, Dr.Pepper, Mountain Dew, Pepsi
- Constant Sum Scale. A fixed number is assign to each attributes reflecting the importance of the respondents attached to it.
- Q-Sort Scale. It uses ranknorder scaling to sort similar objects with respectnto some criteria. The respondents sort the statement or attitudes into piles. Assign the rank to different object in the same group or different among the groups. Example: A restaurant list 50 meals. Choose 10 meals you like, 30 neutral meals and 10 meals you dislike.

WHY IS THE RIGHT SCALE OF MEASUREMENT IMPORTANT?

- It helps you to decide the correct statistical test to be carried out. The research question and the scales of measurement determines the type of statistical test you would use.



OTHER MEASUREMENT SCALE

- Non Comparative Scale. The customer is asked to evaluate a single object. The evaluation is totally independent of other objects.
 - A. Continous Scale. A mark can be placed on a running line from one extreme to the other extreme. The line is split into categories and a score is given.
 - B. Itemized Rating Scale. It is divided i to Likert Scale or Ordinal Scale. It can also be used for Staple Scale. Like -5 to 5 with no zero.

WHY IS THE RIGHT SCALE OF MEASUREMENT IMPORTANT?

- If your research question states relationship, you can use correlation.
- Example: A survey score (Continuous Variable) with age (Continuous Variable), you use the Pearson Correlation.
- Example: The survey score(Continuous Variable) with gender (male or female) (Discrete Variable). Use the T test.

EXAMPLE ON ANALYSIS CHOSEN BASED ON THE SCALE USED.

- Example 1: Survey score (Continuous variable) with student major (more than 2 major) ANOVA TEST.
- Example 2: Survey Score (Continuous Variable) with gender (male/female) T test.
- Example 3: Survey score (Continuous Variable) and age (Continuous variable) Pearson Correlation.
- Example 4: Survey score (Continuous variable) and the number of semesters completed (Continuous Variable) Pearson Correlation
- Example 5: Survey score (Continuous Variable) and the years of experience (Continuous variable) Pearson Correlation.

EXAMPLE OF SCALES USED IN QUESTIONNAIRES

Age – Ratio

Gender –
Nominal

Years of
experience –
Ratio

Chosen major
– Nominal

Completed
semester –
Ratio

Survey score
–
Ordinal/Ratio/
Interval

WHY IS THE RIGHT
SCALE OF
MEASUREMENT
IMPORTANT?

- It has to provide a meaningful way to interpret numbers assign to people, objects and events.



PRINCIPLES IN THE SCALE OF MEASUREMENT.

1. Make the right measurement. Define and understand the measurement to be made. Pilot study will be helpful.
2. Choose the right instrument. Modified or adapted.
3. The right people. Avoid human error. The role and the responsibility need to be understood.
4. Check the research instrument regularly.
5. Follow appropriate written measurement procedure.
6. Consistency in the measurement so the result can be reproduce.