**Research Methodology (Lecture Four) By: Noman Yaser**

**MEASUREMENT**

Measurement involves categorising and/or assigning values to the variable in querstion, and can be diverse in nature and level of operation.

To statistically analyse self report, a researcher must have appropriate measurenmentt scales allowing them to convert collected information into numerals (Smith, 2000).

Measurement may be qualitaitive as well as quantitative. Qualiitative attributes have labels or names rather than numbers, assigned to the respective categories. A measuring instrument may be uni-dimensional or multi-dimensional.

**Levels of Measurement**

Levels of measurement of a variable refer to how the values of varaiables relate to each other. Stevens (1951) has desrcribed four levels of measurement which include: Nominal, Ordinal, Interval and Ratio levels.

**Nominal Level**

It is the simplest, the lowest and the most primitive. Measurement at this level involves classification of events into categories that must be distinct, uni-dimensiuonal, mutually exclusive and exhaustive. It is used for qulaitative data only.

Such a measure indicates that there is a difference between the categories considered. Such difference refers to nature but not the magnitude.

Numbers assigned to categories have no mathematical meanings, are used only for identifications and cannot be added, subtrtacted, multiplied or divided. Classifying the respondents into categories (male/female, Black/white, single/married) is based on nominal measurement. These may base on binary (male/female) and multi-categorical (Muslim,Sikh, Christian, Hindu etc). We can not rank the categories.

**Ordinal Level**

Measurement at this level involves not only categorical elements into groups, but ordering of data and ranking of variables into a continuum ranging according to magnitude that is from lowest to heighest point. Here, numbers offer more information since they not only indicate difference between categories but they also rank them; however they donot allow mathematical operations.

The order of magnitude allows categories to be rankec (who is first, second and last), but does not indicate the amount of difference between the groups. So, the difference between Ist and 2nd may be different from that between 6th and 7th category. The interval between categories is not necessarily equal. For example, status (low, middle, high), Quality (very poor, poor, good, very good, excellent).

Hence, we begin assigning numbers to the ranks, we run into problems in the form of ties.

Pakistan + Australia 1+2=3/2=1.5, 1.5

More properties included: r>1, r+1>r+2, so r> r+2

**Interval Level**

This level provides information about the distance between the levels and contains equal intervals. At this level, values can be ranked and the difference between the values of variables has the same meanings at different points of the scale.

By it, we may determine how many unit’s difference are from one rank to the next. One unit difference means the same whenever it occurs in the scale. Thus, we may find that there is only one unit difference between oldest and second oldest (person of age 90 and 89) and 27 years difference between the second oldest and the third oldest (89 and 62 years).

Characteristics of this level are that it includes equal units, and essentially a quantitative measure. Interval measurement allows the researchers to determine whether two values are same or different (as in nominal), whether one is greater or smaller (as in ordinal), and the degree of difference between them.

If an IQ of two students is 100 and 125 respectively, in nominal terms, this means that they have different IQs, in ordinal terms that the first has lower IQ than the second; and in interval terms that IQ of second students is 25 points higher than the first.

At this level, the numbers assigned to categories can be added, and subtracted from each other.

**Ratio Level**

Measurement at this level includes all the attributes the other three forms offer, plus the option of an absolute (fixed and non- arbitrary) zero point (which in essence means the absence of variable in question). This level allows multiplication and division also. It allows the researchers to make statements about proportions and ratios, that is to relate one value to another.

For example, a comparison of speed of two students 10 seconds and 20 seconds, allows the researchers to conclude that the first is as twice faster than the other. Twenty years old is twice as old as 10 years old, 15 years old as half than 30.

In the social sciences, this level of measurement is employed mainly when measuring demographic variables; however, it is considered inappropriate for measuring attitudes and opinions. Indicating a zero option in an attitude scale means no attitude or no opinion is incorrect as no opinion is in itself opinion.

In terms of Mathematics, numbers arrived at through ratio ordering indicates counting as well as ranking, and can also be added, subtracted, multiplied and divided.

Examples: degrees of temperature, height, weight, number of family members etc.