

Course: CC-5(Research Methods in sociology)
Scaling, Scale Classification Bases, Scaling Techniques

Part-A

Scaling

In research we quite often face measurement problem (since we want a valid measurement but may not obtain it), specially when the concepts to be measured are complex and abstract and we do not possess the standardised measurement tools. Alternatively, we can say that while measuring attitudes and opinions, we face the problem of their valid measurement. Similar problem may be faced by a researcher, of course in a lesser degree, while measuring physical or institutional concepts. As such we should study some procedures which may enable us to measure abstract concepts more accurately. This brings us to the study of scaling techniques.

Meaning of Scaling

Scaling describes the procedures of assigning numbers to various degrees of opinion, attitude and other concepts. This can be done in two ways viz., (i) making a judgement about some characteristic of an individual and then placing him directly on a scale that has been defined in terms of that characteristic and (ii) constructing questionnaires in such a way that the score of individual's responses assigns him a place on a scale. It may be stated here that a scale is a continuum, consisting of the highest point (in terms of some characteristic e.g., preference, favourableness, etc.) and the lowest point along with several intermediate points between these two extreme points. These scale-point positions are so related to each other that when the first point happens to be the highest point, the second point indicates a higher degree in terms of a given characteristic as compared to the third point and the third point indicates a higher degree as compared to the fourth and so on. Numbers for measuring the distinctions of degree in the attitudes/opinions are, thus, assigned to individuals corresponding to their scale-positions. All this is better understood when we talk about scaling technique(s). Hence the term 'scaling' is applied to the procedures for attempting to determine quantitative measures of subjective abstract concepts. Scaling has been defined as a "procedure for the assignment of numbers (or other symbols) to a property of objects in order to impart some of the characteristics of numbers to the properties in question.

Scale Classification Bases

The number assigning procedures or the scaling procedures may be broadly classified on one or more of the following bases: (a) subject orientation; (b) response form; (c) degree of subjectivity; (d) scale properties; (e) number of dimensions and (f) scale construction techniques. We take up each of these separately.

(a) Subject orientation: Under it a scale may be designed to measure characteristics of the respondent who completes it or to judge the stimulus object which is presented to the respondent. In respect of the former, we presume that the stimuli presented are sufficiently homogeneous so that the between stimuli variation is small as compared to the variation among respondents. In the latter approach, we ask the respondent to judge some specific

object in terms of one or more dimensions and we presume that the between-respondent variation will be small as compared to the variation among the different stimuli presented to respondents for judging.

(b) Response form: Under this we may classify the scales as categorical and comparative. Categorical scales are also known as rating scales. These scales are used when a respondent scores some object without direct reference to other objects. Under comparative scales, which are also known as ranking scales, the respondent is asked to compare two or more objects. In this sense the respondent may state that one object is superior to the other or that three models of pen rank in order 1, 2 and 3. The essence of ranking is, in fact, a relative comparison of a certain property of two or more objects.

(c) Degree of subjectivity: With this basis the scale data may be based on whether we measure subjective personal preferences or simply make non-preference judgements. In the former case, the respondent is asked to choose which person he favours or which solution he would like to see employed, whereas in the latter case he is simply asked to judge which person is more effective in some aspect or which solution will take fewer resources without reflecting any personal preference. Considering scale properties, one may classify the scales as nominal, ordinal, interval and ratio scales. Nominal scales merely classify without indicating order, distance or unique origin. Ordinal scales indicate magnitude relationships of 'more than' or 'less than', but indicate no distance or unique origin. Interval scales have both order and distance values, but no unique origin. Ratio scales possess all these features.

(e) Number of dimensions: In respect of this basis, scales can be classified as 'unidimensional' and 'multidimensional' scales. Under the former we measure only one attribute of the respondent or object, whereas multidimensional scaling recognizes that an object might be described better by using the concept of an attribute space of 'n' dimensions, rather than a single-dimension continuum.

(f) Scale construction techniques: Following are the five main techniques by which scales can be developed.

(i) *Arbitrary approach:* It is an approach where scale is developed on *ad hoc* basis. This is the most widely used approach. It is presumed that such scales measure the concepts for which they have been designed, although there is little evidence to support such an assumption.

(ii) *Consensus approach:* Here a panel of judges evaluate the items chosen for inclusion in the instrument in terms of whether they are relevant to the topic area and unambiguous in implication.

(iii) *Item analysis approach:* Under it a number of individual items are developed into a test which is given to a group of respondents. After administering the test, the total scores are calculated for every one. Individual items are then analysed to determine which items discriminate between persons or objects with high total scores and those with low scores.

(iv) *Cumulative scales* are chosen on the basis of their conforming to some ranking of items with ascending and descending discriminating power. For instance, in such a scale the endorsement of an item representing an extreme position should also result in the endorsement of all items indicating a less extreme position.

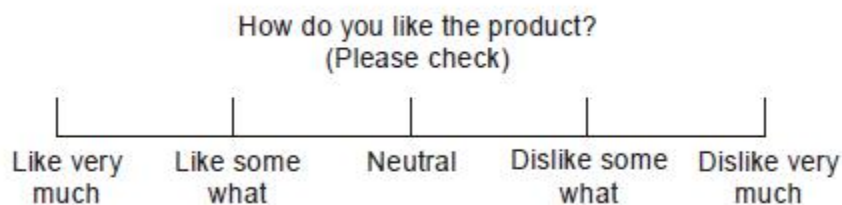
(v) *Factor scales* may be constructed on the basis of inter correlations of items which indicate that a common factor accounts for the relationship between items. This relationship is typically measured through factor analysis method.

Important Scaling Techniques

We now take up some of the important scaling techniques often used in the context of research specially in context of social or business research.

Rating scales: The rating scale involves qualitative description of a limited number of aspects of a thing or of traits of a person. When we use rating scales (or categorical scales), we judge an object in absolute terms against some specified criteria i.e., we judge properties of objects without reference to other similar objects. These ratings may be in such forms as “like-dislike”, “above average, average, below average”, or other classifications with more categories such as “like very much—like somewhat—neutral—dislike somewhat—dislike very much”; “excellent—good—average—below average—poor”, “always—often—occasionally—rarely—never”, and so on. There is no specific rule whether to use a two-points scale, three-points scale or scale with still more points. In practice, three to seven points scales are generally used for the simple reason that more points on a scale provide an opportunity for greater sensitivity of measurement. Rating scale may be either a graphic rating scale or an itemized rating scale.

(i) *The graphic rating scale* is quite simple and is commonly used in practice. Under it the various points are usually put along the line to form a continuum and the rater indicates his rating by simply making a mark (such as ü) at the appropriate point on a line that runs from one extreme to the other. Scale-points with brief descriptions may be indicated along the line, their function being to assist the rater in performing his job. The following is an example of five-points graphic rating scale when we wish to ascertain people’s liking or disliking any product:



This type of scale has several limitations. The respondents may check at almost any position along the line which fact may increase the difficulty of analysis. The meanings of the terms like “very much” and “some what” may depend upon respondent’s frame of reference so much so that the statement might be challenged in terms of its equivalency. Several other rating scale variants (e.g., boxes replacing line) may also be used.

(ii) The *itemized rating scale* (also known as numerical scale) presents a series of statements from which a respondent selects one as best reflecting his evaluation. These statements are ordered progressively in terms of more or less of some property. An example of itemized scale can be given to illustrate it. Suppose we wish to inquire as to how well does a worker get along with his fellow workers? In such a situation we may ask the respondent to select one, to express his opinion, from the following:

- n He is almost always involved in some friction with a fellow worker.
- n He is often at odds with one or more of his fellow workers.
- n He sometimes gets involved in friction.
- n He infrequently becomes involved in friction with others.

n He almost never gets involved in friction with fellow workers.

The chief merit of this type of scale is that it provides more information and meaning to the rater, and thereby increases reliability. This form is relatively difficult to develop and the statements may not say exactly what the respondent would like to express. Rating scales have certain good points. The results obtained from their use compare favourably with alternative methods. They require less time, are interesting to use and have a wide range of applications. Besides, they may also be used with a large number of properties or variables. But their value for measurement purposes depends upon the assumption that the respondents can and do make good judgements. If the respondents are not very careful while rating, errors may occur. Three types of errors are common viz., the error of leniency, the error of central tendency and the error of halo effect. The error of leniency occurs when certain respondents are either easy raters or hard raters. When raters are reluctant to give extreme judgements, the result is the error of central tendency. The error of halo effect or the systematic bias occurs when the rater carries over a generalised impression of the subject from one rating to another. This sort of error takes place when we conclude for example, that a particular report is good because we like its form or that someone is intelligent because he agrees with us or has a pleasing personality. In other words, halo effect is likely to appear when the rater is asked to rate many factors, on a number of which he has no evidence for judgement.

Ranking scales: Under ranking scales (or comparative scales) we make relative judgements against other similar objects. The respondents under this method directly compare two or more objects and make choices among them. There are two generally used approaches of ranking scales viz.

(a) Method of paired comparisons: Under it the respondent can express his attitude by making a choice between two objects, say between a new flavour of soft drink and an established brand of drink. But when there are more than two stimuli to judge, the number of judgements required in a paired comparison is given by the formula:

$$N = \frac{n(n-1)}{2}$$

Where N = number of judgements

n = number of stimuli or objects to be judged.

For instance, if there are ten suggestions for bargaining proposals available to a workers union, there are 45 paired comparisons that can be made with them. When N happens to be a big figure, there is the risk of respondents giving ill considered answers or they may even refuse to answer. We can reduce the number of comparisons per respondent either by presenting to each one of them only a sample of stimuli or by choosing a few objects which cover the range of attractiveness at about equal intervals and then comparing all other stimuli to these few standard objects. Thus, paired-comparison data may be treated in several ways. If there is substantial consistency, we will find that if X is preferred to Y , and Y to Z , then X will consistently be preferred to Z . If this is true, we may take the total number of preferences among the comparisons as the score for that stimulus. It should be remembered that paired comparison provides ordinal data, but the same may be converted into an interval scale by the method of the *Law of Comparative Judgement* developed by L.L. Thurstone. This technique involves the conversion of frequencies of preferences into a table of proportions which are

then transformed into Z matrix by referring to the table of area under the normal curve. J.P. Guilford in his book "Psychometric Methods" has given a procedure

(b) Method of rank order: Under this method of comparative scaling, the respondents are asked to rank their choices. This method is easier and faster than the method of paired comparisons stated above. For example, with 10 items it takes 45 pair comparisons to complete the task, whereas the method of rank order simply requires ranking of 10 items only. The problem of transitivity (such as A prefers to B , B to C , but C prefers to A) is also not there in case we adopt method of rank order. Moreover, a complete ranking at times is not needed in which case the respondents may be asked to rank only their first, say, four choices while the number of overall items involved may be more than four, say, it may be 15 or 20 or more. To secure a simple ranking of all items involved we simply total rank values received by each item. There are methods through which we can as well develop an interval scale of these data. But then there are limitations of this method. The first one is that data obtained through this method are ordinal data and hence rank ordering is an ordinal scale with all its limitations. Then there may be the problem of respondents becoming careless in assigning ranks particularly when there are many (usually more than 10) items which is relatively easier. The method is known as the *Composite Standard Method*.

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