

A PROPOSED METRIC SCALE FOR EXPRESSING OPINION

BY :

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EXECUTIVE SUMMARY

Behavioural scientists have always coveted to find the most perfect way to measure qualitative attributes, in a way that is almost similar to measuring quantitative variables. Unlike quantitative attributes, such as length and weight, qualitative attributes do not have physical appearance which is visible and touchable, only experienced and felt by human beings. Matheson (2008) emphasized that measurement in human sciences such as in sociology is attempting to quantify the intangible. Thus measurement of qualitative attributes demand appropriate attention and consideration.

As to date there is no unanimity among researchers in behavioural sciences on a scale that could quantify intangible variables as quantitative magnitudes. The lack of a unanimously acceptable scale is identified as the root cause that sparked the ongoing debate among behavioral scientists. There is not yet a scale that is accepted by all scholars to measure or quantify or interpret attributes such as opinion, satisfaction or agreement in terms of numbers. At the moment, it is not clear exactly how scales to evaluate questionnaire items should be designed and implemented in order to reduce the random and systematic measurement errors (Sturgis, Roberts, & Smith, 2014).

Researchers have tried to overcome the lack of scale using two methods, i) apply mathematical modelling techniques to rescale data collected using scales such as Likert scale into continuous data (Granberg-Rademacker, 2010; Harwell & Gatti, 2001; Hsu, Chang, & Hung, 2007; Wu, 2007) and ii) develop a scale using straight line of various lengths called 'Continuous Response Scale' or 'Visual Analogue Scales' (Aitken, 1969; Cella & Perry, 1986; Ferrando, 2003; Lerdal, Kottorp, Gay, & Lee, 2013; Munshi, 1990; Pfennings, Cohen, & van der Ploeg, 1995; Puzziawati Ab Ghani & Abdul Aziz, 2005).

In conclusion, to obtain interval data using mathematical modelling techniques, researchers must begin collecting data using either Likert scale or other ordinal scales. Besides the complex mathematical procedures, there is still a question of how accurate does the rescaled data do represent the actual data. Even though both approaches outlined above are popular among researchers they have not yet satisfied the need for a scale that could quantify qualitative attributes; explicitly, the need for an interval scale is still unfulfilled. This is the problem that this study has identified.

This study tries to find answers to several research questions: i) What properties should a scale to measure qualitative attributes in terms of numbers have? In other words what are the properties of continuous (metric) interval scale? ii) What is the best scale layout or design that will assist quick and easy data collection, and iii) Once such scale has been developed, psychometrically will it perform better than a popular existing scale used to measure qualitative attributes? That is, will the data collected using the scale have better validity and reliability coefficients?

To answer the research questions, this study has embarked on the following objectives: i) To discover identify the properties or features of a scale that could be accepted

as a metric interval scale, ii) To determine propose the best scale design or layout and then develop the metric scale, and iii) To compare psychometrically, performance of developed scale with a popular existing scale to measure qualitative attributes.

The research methodology involved two stages: i) obtaining the best scale design, and ii) testing scale performance in terms of scale usability and psychometric properties. The following scale which is called the Ruler & Option (RO) scale was developed:

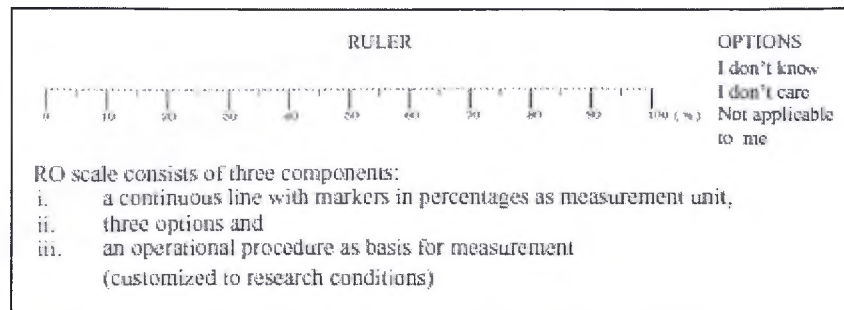


Figure 1: Ruler & Option (RO) scale

The scale has three main features: i) meaningful zero point, ii. a measurement unit, and iii. clearly defined operational procedure as the basis for measurement. Results from a repeated measurement survey showed that data from RO scale performed better than data from 7-point Likert scale in terms of number of items per construct, factor loadings, squared multiple correlations, higher internal reliability, higher internal consistency of the items representing a construct, and higher percentage of variance explained by the items in a construct. Measurement model using RO scale had higher ratio of degree of freedom to number of parameters, thus providing more mathematical information to estimate model parameters. In terms of validity coefficients, measurement model using RO scale had higher convergent validity. However, measurement models using both scales achieved almost the same level of discriminant and construct validity. Previous study had shown that RO scale was easy to use (on the respondents' part) and easy to administer (on the researcher's part) (Rohana Yusoff & Roziah Mohd Janor, 2012).

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APPENDIX 1: Journal paper

Rohana Yusoff, & Roziah Mohd Janor. (2014). Generation of an Interval Metric Scale to Measure Attitude. *SAGE Open*, 4(1). doi: 10.1177/2158244013516768

APPENDIX 2 : Conference paper

Rohana Yusoff, & Roziah Mohd Janor. (2015). *Should we provide non-attitude options in rating scales?* Paper presented at the International Symposium on Mathematical Sciences & Computing Research (iSMSC) 2015, Ipoh, Perak, Malaysia.